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1031st Meeting—19 June 1961

EIGHTY-SECOND ANNUAL MEETING

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The 1032nd meeting will be held in December 1961.

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A NEW SPECIES OF *CINARA* FROM KNOB-CONE PINE (APHIDAE)

By F. C. Hottes

This new species of *Cinara* is named for Prof. E. O. Essig who for half a century has contributed materially to our knowledge of the family Aphidae.

Cinara essigi, new species

Apterous viviporous female: Length from vertex to end of cauda 4.5 mm. Color in life not recorded. As cleared, stained and mounted it is as follows: Head and first antennal segment dark dusky with median transverse suture much darker; thorax dusky; abdomen pale, reticulated, wax glands small, arranged in four rows, rather more lateral than dorsal; cornicles dark dusky, often with clear areas; cauda and anal plate dusky; anterior to the transverse pigmented areas there are two narrow, very irregular pigmented areas; second antennal segment not as dark as first; basal portion of third antennal segment pale, apical third dusky; basal half of fourth antennal segment pale, remainder dusky, fifth segment similar to fourth; all of sixth antennal segment dusky; all femora pale dusky with basal portions not quite so dark; all tibiae with short portion near base dusky brown, this followed by pale area, which in the case of the metathoracic tibiae is 0.75 mm in length; remainder of tibiae dusky brown; tarsal segments brown.

Head and thorax: Width of head through the eyes 0.825 mm. Length of antennal segments as follows: III 0.55 mm, IV 0.275 mm, V 0.30 mm, VI 0.15 + 0.045 mm. Third antennal segment without sensoria. Fourth antennal segment with or without primary sensorium. Fifth antennal segment with one secondary sensorium, and the primary. Marginal sensoria on sixth antennal segment three, arranged in a straight row. Hairs on antennal segments sparse, upstanding, on third antennal segment varying from 0.03–0.075 mm. Hairs on vertex of head 0.09 mm in length. Ocular tubercles small. Last three segments of the rostrum with the following lengths: 0.31, 0.30, 0.12 mm. Rostrum reaching to mid region of cornicles. Mesosternal tubercle well developed, about 0.09 mm in length, with a distinct neck, apex enlarged. Metathoracic femora 1.53 mm in length. Metathoracic tibiae 2.70 mm in length. Hairs on metathoracic tibiae set at an angle slightly less than 45 degrees, but more than 30 degrees. Hairs on outer margin of tibiae not uniform in length, varying from 0.05–0.075

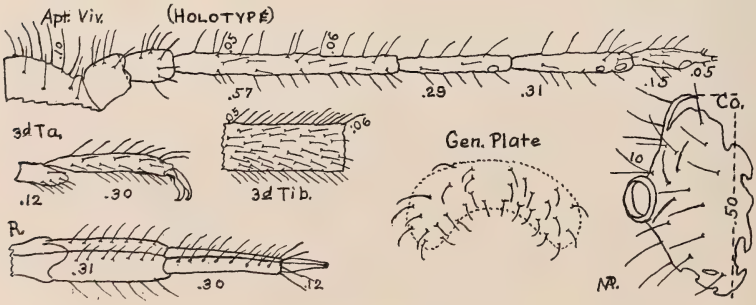
mm, fine, sharp pointed, hardly numerous, and not droopy. First segment of metatarsus 0.12 mm in length, provided on the ventral surface with about eighteen hairs. Second segment of metatarsus 0.30 mm in length, joined to first segment by a distance about equal to the width of segment, the hairs on the dorsal surface longer than the hairs on the ventral surface.

Abdomen: Dorsal surface of abdomen reticulated. Hairs on dorsal surface of abdomen not numerous, about 0.075 mm in length. Hairs on ventral surface of abdomen not as long or as numerous as hairs on dorsal surface. Hairs on transverse pigmented area rather coarse, varying from 0.13–0.15 mm in length, and with the exception of two or three, arranged along the posterior margin. Cornicles with outer margin very irregular, 0.45 mm across. The orifice of the cornicles is acentric, much more lateral than median. Hairs on cornicles sparse, about 0.10 mm in length. Genital plate with posterior margin concave; median anterior margin free from hairs.

Remarks: Antennal segments varying in length as follows: III 0.525–0.57 mm, IV 0.275–0.30 mm, V 0.285–0.30 mm, VI 0.105–0.15 mm + 0.045–0.05 mm. Hairs on vertex of head varying from 0.09–0.10 mm. Rostrum in one case with segments 3, 4 and 5 reaching beyond cornicles. In one case the metathoracic tibiae are only 1.77 mm in length.

In some respects this species is allied to *C. ponderosae* (W) but it has a mesosternal tubercle which is lacking in that species. The hairs on the metathoracic tibiae are more numerous and less spinelike, and the abdomen is free from small pigmented spots. This species is difficult to key in Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region, because the limited number of specimens (six) fall in both alternatives of couplet number 18. However, the hairs on the metathoracic tibiae are shorter than 0.08 mm and not semi-spinelike. It is not the species *C. brevispinosa* (G & P). It is not *C. apini* (G & P), inasmuch as the antennal segments are too long, the tibial hairs longer and rostral segment IV is 0.30 mm not 0.17–0.20 mm.

Holotype: Apterous viviparous female deposited in collection of the United States National Museum. Paratype slide in collection of author. The host is knob-cone pine (*Pinus attenuata*). Oak Glen, San Bernardino Co., California. R. C. Dickson, 20 November 1938.



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NOTES ON VENEZUELAN BIRDS AND DESCRIPTION OF A NEW SUBSPECIES OF TROCHILIDAE

By William H. Phelps and William H. Phelps, Jr.

Our thanks to the Curators of the American Museum of Natural History, Carnegie Museum, Museum of Comparative Zoology and U. S. National Museum for access to their collections during our research for this paper. Specimens listed are in the Phelps Collection, Caracas, unless otherwise specified. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

Lafresnaya lafresnayi greenewalti, new subspecies

Type: From Llano Rucio, Estado Mérida, Venezuela; 2500 meters. Number 14185, Phelps Collection, Caracas. Adult male collected 7 September 1941, by Fulvio Benedetti. (Type on deposit at the American Museum of Natural History.)

Diagnosis: Differs from *L. lafresnayi liriope* Bangs, of the Santa Marta Mountains, by having a more yellowish tint, being less greenish blue; from *L. l. saül* Delattre and Bourcier, of western Colombia and Ecuador, differs by having a straighter bill and longer wings without overlap; and from *L. l. lafresnayi* Boissoneau, of eastern Colombia and the Páramo de Tamá, by having white on the rectrices instead of yellow.

Range: The Cordillera de los Andes in eastern Táchira and Mérida, in forests in the Subtropical and Temperate zones at altitudes from 2200 to 3000 meters.

Description of type: Sides of head, back and uropygium Calliste Green × Scheele's Green, crown with a dusky tint. Chin, throat and upper breast Deep Turtle Green with metallic luster; center of lower breast and abdomen black; sides, flanks and under tail-coverts and axillaries similar to back, base of under tail-coverts white. Remiges Burnt Umber; greater wing-coverts similar to remiges; the median, lesser and under ones similar to back. The two central rectrices near Olive Lake, the others white partially margined apically with dark greenish.

Mandible (in life) "black"; maxilla "flesh"; feet "flesh"; iris "dark." Wing, 65 mm; tail, 39; exposed culmen, 26; culmen from base, 32.

Remarks: Sexes unlike in color, males with longer wings. Range of measurements: seven adult males, including type—wing, 64–68 (65.7); tail, 32–39 (36.7); exposed culmen, 25–26 (25.6); three adult females—wing, 61–62 (61.3); tail, 37–37 (37); exposed culmen, 26–27 (26.7). Measurements of *liriope,* of the Santa Marta Mountains: four adult males—wing, 63–69 (65.2); tail (3), 37.5–39 (38.1); exposed culmen (2), 24–24.5 (24.2). Measurements of *saül,* from Ecuador: fifteen adult males—wing, 59–63 (61.5); tail (5), 36–38 (37.4); exposed culmen (7), 25–27 (25.9).

The adult female differs from the male by having a yellowish breast, whitish abdomen and immaculate yellow under tail-coverts, the breast lightly spotted with greenish.

The juvenile male differs from the female by having the breast yellowish green instead of yellow; the under tail-coverts are as in the adult.

The ranges of the white-tailed forms *saül* and *liriope* are separated from that of the other white-tailed form, the new *greenewalti,* by the yellow-tailed *lafresnayi* of the eastern Andes of Colombia.

It is with special pleasure that we dedicate this new subspecies to our friend, Crawford H. Greenewalt, photographer extraordinary of hummingbirds, in recognition of his important contributions to the knowledge of the Trochilidae.

SPECIMENS EXAMINED

Lafresnaya lafresnayi liriope.—COLOMBIA: Sierra Nevada de Santa Marta, San Miguel, 1♂[2], 1♂[3], 1♂[4]; Páramo de Chirucua, 1♂[4] (type); Chinchicua, 1♀[3]; Río Guatapuri, 6♀[3].

L. l. lafresnayi.—VENEZUELA: Páramo de Tamá, 2♀. COLOMBIA:[1] "Bogotá," 12♂, 4♀, 3 juv. ♂; El Piñón, 1♂; Subía, 1♂; El Roble, 1♀; Río Toche, 1 juv. ♂; Chipaqua, 1♀.

L. l. greenewalti.—VENEZUELA: Cordillera de los Andes, Boca de Monte, Táchira, 1♂; Valle, Mérida, 1 juv. ♂; Llano Rucio, 1♂ (type), 1 juv. ♂; Páramo Aricagua, 1♂; "Merida,"[1] 3♂, 2♀; Montañas Culata, 1♂[1]; páramos Escorial, 1♀[1] y Tambor, 1♀[1]; Nevados, 1♀[1]; Montañas Conejos, 1♀[1].

L. l. saül.—ECUADOR: (var. loc.)[1]; 16♂, 15♀.

L. l. orestes.—PERÚ: (var. loc.)[1]; 4♂, 4♀, 2 juv. ♂.

L. l. rectirostris.—PERÚ: Ramicruz, Junín,[1] 2♂, 3♀.

Veniliornis fumigatus fumigatus (D'Orbigny and Lafresnaye)

Picus fumigatus D'Orbigny and Lafresnaye, Voy. Am. Merid., Ois., 1840; p. 380, 1847. (Yungas, Bolivia.)

Phaeonerpes reichenbachi Cabanis and Heine, Mus. Hein., 4: 141, 1863. (Caracas, Venezuela.)

Veniliornis oleaginus tectricialis Chapman, Amer. Mus. Novit., no. 191, p. 6, 1925. (Turumiquire, 7900 ft, northeastern Venezuela.)

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[1] Specimens in American Museum of Natural History.

[2] Specimens in Carnegie Museum.

[3] Specimens in U. S. National Museum.

[4] Specimens in Museum of Comparative Zoology.

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Todd (1946: 308) was correct in considering that these three races, inhabiting the northern mountains of Venezuela, could not be separated one from the other.

Comparison of the 64 Venezuelan specimens in our collection: 27 *fumigatus* from the Perijá and Mérida regions; 32 former *reichenbachi* from the Caracas region; 5 former *tectricialis* from the Turumiquire (northeastern) region; and the 36 specimens of *fumigatus* in the American Museum of Natural History from Colombia, Ecuador, Perú and Bolivia, shows that these three races are similar the one to the other, in color and in size.

The supposed shorter wing of *reichenbachi* of the Caracas region (Cory, 1911: 473; Zimmer, 1942: 8) is not apparent. Chapman (1925: 6) described *tectricialis* on two specimens based on the character that both webs of the tectrices were barred. Our five specimens and those of the Carnegie Museum, from localities in the same mountain range, also lack the barring on the outer webs of the tectrices. Emmet R. Blake, Curator of birds at the Chicago Natural History Museum, writes to us that his five topotypical specimens from Mt. Turumiquire have the barring on the wing feathers restricted to the inner web. Four specimens in our collection from the Caracas region and one from the Mérida region have indications of barring on the outer web. Consequently we presume the character on Chapman's two specimens is individual variation.

These are the specimens in our collection: Perijá region: Kunana, 1♂, 1(?); cerros Pejochaina, 3♂, Tetarí, 1♀ and Mashirampé, 2♂, 2♀; ríos Macoita-Apón, 1♀. Mérida region: Táchira—Las Delicias, Páramo de Tamá, 2♀; Río Chiquito, 1(?); Queniquea, 3♂, 1♀, 2(?); Páramo Zumbador, 1♂; Mérida—Valle, 1♀; La Azulita, 1♀; Santo Domingo, 1♂, 1♀. Caracas region: Yaracuy—Cerro Aroa, 2♀, 2(?); Aragua—Colonia Tovar, 3♂, 5♀, 3(?); Cerro Golfo Triste, 4♂, 1(?); Distrito Federal—Galipán, 1♂, 3♀; El Junquito, 2♂, 4♀, 1(?); Miranda—Guarenas, 2♀. Turumiquire region: Anzoátegui—Bergantin, 1♀; Monagas—Caripe, 1♀; Cerro Negro, 1♀, 1(?).

Thamnophilus punctatus subcinereus (Todd)

Erionotus punctatus subcinereus Todd, Proc. Biol. Soc. Washington, 28: 80. 1915. (Don Diego, Santa Marta, Colombia.)

In our "Lista de las Aves de Venezuela y su Distribución," p. 73, 1950, we erroneously gave a Venezuelan range to the race *atrinucha* Salvin and Godman. Further material and research show that our specimens are referable to *T. p. subcinereus* Todd, of the Perijá and Mérida regions.

Contopus sordidulus saturatus Bishop

Contopus richardsonii saturatus Bishop, Auk, 17: 116. 1900. (Haines, Alaska.)

1(?), Sierra de Lema, Gran Sabana, Bolívar. Collected on 21 February 1959 at kilometer 125 on the new road from El Dorado.

This is the first record for South America. The A.O.U. Check List, 5th edition, p. 349, 1957, says: "winter home unknown."

Basileuterus tristriatus auricularis Sharpe

Basileuterus auricularis Sharpe, Cat. Birds Brit. Mus., 10: 386. (Bogotá.)

Basileuterus tristriatus perijanus Phelps and Phelps, Jr., Proc. Biol. Soc. Washington, 66: 137. 10 August 1953. (Cerro Pejochaina, upper Río Negro, Sierra de Perijá, Zulia.)

Subsequent research has shown that *B. t. perijanus* is inseparable from *B. t. auricularis* and it thus becomes a synonym.

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STUDIES ON ANDEAN COMPOSITAE V

By José Cuatrecasas
Department of Botany, Smithsonian Institution, Washington, D.C.

This contribution includes comments and descriptions of species of *Hinterhubera, Erigeron, Diplostephium, Paragynoxys, Senecio,* and *Chaptalia.* The materials used for this study are the South American collections of the U. S. National Museum, mainly those from the author's 1959 expedition to the Sierra Nevada de Santa Marta and Sierra de Perijá, Colombia. This trip was sponsored by the National Science Foundation and received substantial help in Colombia from the Instituto de Ciencias Naturales and from the Ministerio de Agricultura of the Colombian Government. A member of the Institute, R. Romero Castañeda, joined the expedition.

Contributions on novelties in other groups will follow this one, and an account of the expedition and its results will be published when the materials are identified. The work upon which this paper is based has been sponsored by the National Science Foundation. The preceding article of this series was published in Brittonia, 12: 182–195 (1960).

Hinterhubera nevadensis Cuatr., sp. nov.

Frutex 20–50 cm altus caule basi intricato-ramificato, ramis basi prostratis vel erectis exfoliatis cortice griseo-purpurascenti glabrato squamulis brevibus persistentibus munito; ramuli dense foliosi erecti congestique, copiose glandulosi glandulis minutis pedicellatis foliis subimbricatis plusminusve obtecti.

Folia alterna sessilia ascendentia anguste linearia margine valde revoluto-plicata, 5–9 mm longa 0.8–1.2 mm lata, extus utrinque dense pubescenti-villosa glandulosaque pilis sericeis longis (ad 1 mm) patulis plusminusve flexuosis et glandulis globosis minutis stipitatis vestita, intra plicaturam (subtus folii) densissime glandulosa glandulis breviter stipitatis vel subsessilibus. Lamina crassiuscula 3–5 mm longa oblonga basi

paulo angustata et sine sensu in vaginam 2–4 mm longam paulo dilatatam margine longe ciliatam ad caulem adpressam producta.

Capitula discoidea heterogama semiorbiculari-campanulata circa 10 mm alta et diamitentia, explanata 17–19 mm diamitentia, ad terminationem ramulorum breviter pedunculata solitaria (pedunculo ad 10 mm longo). Involucrum 9–10 mm altum bracteis 40 et ultra circa 5-seriatis lineari-lanceolatis acutiusculis nervo medio valde conspicuo intus glabris extus copiose ciliato-villosis et glandulosis glandulis stipitatis et sessilibus praeditis, interioribus fertilibus 7.5–8 mm longis circa 1 mm latis exterioribus gradatim brevioribus ad 5 mm longis 1 mm latis. Flores exteriores feminei tubulosi pluriseriati 90–170 in capitulo involucrum non excedentes, corolla albido-flavescenti 4.5–5 mm longa glabra tubulo capillari 3–3.5 mm longo limbo 5-partito vel 4-partito lobis paulo inaequalibus elliptico-lanceolatis circa 1.2 mm longis; rami styli 0.6–0.7 mm longi lineares supra marginibusque minutissime papillosi; ovarium anguste oblongum basim versus angustatum subcompressum paulo villosum parce glandulosum circa 2.5 mm longum; pappus pilis 2–3-seriatis tenuibus breviter strigulosis inaequilongis 0.2–5.5 mm longis stramineis. Flores centrales hermaphroditi 16–60; corolla regularis tubulosa 4–4.5 mm longa sparsis glandulis capitatis munita, tubulo circa 2 mm longo limbo infra tubuloso sursum gradatim ampliato apice 5 lobis late oblongis subacutis circa 1 mm longis; antherae 1.3 mm longae basi breviter auriculatae; styli rami 0.8 mm longi extus marginibusque dense piloso-papillosi; ovarium anguste lineare paulo compressum basi angustatum 3 mm longum glandulis globosis sessilibus et pilis rigidulis subpatulis dense munitum; pappus stramineus circa 5.5 mm longus pilis inaequilongis (aliquis valde brevibus) breviter strigulosis apicem versus paulo dilatatis apice acutis. Receptaculum alveolatum nudum 3.5–4 mm diamitens. (Fig. 1, *a–j.*)

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slope: valley descending from the peaks La Reina and Ojeda southwestward; páramos between lakes Naboba and Mamito, 4200–4300 m alt.; shrub 20–50 cm high; involucre brownish, green at base; female corollas pale yellowish white; 3 October 1959, J. Cuatrecasas & R. Romero Castañeda 24585. Holotype, US; isotype, COL.

Remarks: Hinterhubera nevadensis is closely related to the Venezuelan species *H. columbica* Schultz Bip. ex Wedd. and *H. ericoides* Wedd. As in *H. columbica,* it has large heads and glandular leaves, but it differs by its more narrowly linear and smaller leaves and its smaller female corollas which do not surpass the involucre, and which have 5–4 shorter lobes. *H. columbica* has subbilabiate female corollas longer than the involucre, 5–7 mm long, with 3 long-linear lobes (2.3–3 mm long) and 2 additional very short lobes which may be reduced to none; the leaves in the Venezuelan species are more broadly sublanceolate-oblong. *H. nevadensis* differs from *H. ericoides* by its larger heads and leaves and by being densely glandular. In *H. columbica* the extended, pressed heads (in herbarium) are 16–20 mm and in *H. ericoides* only 8–12 mm in diameter.

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Erigeron peruvianus (Lam.) Cuatr., comb. nov.
Doronicum peruvianum Lam., Encyclop. Meth. 2: 316. 1786.
Arnica peruviana (Lam.) Pers., Syn. Plant. 2: 454. 1807.
Aster pellitus HBK, Nov. Gen. Sp. Pl. 2: 91. 1820.
Liabum erigeroides Benth., Pl. Hartw. 206. 1845.
Celmisia pellita (HBK) Sch. Bip., Bonplandia 4: 50. 1856.
Erigeron pellitum (HBK) Wedd., Chl. And. 1: 190, Pl. 34. 1857.
Erigeron lehmannii Hieron., Engl. Bot. Jahrb. 19: 49. 1894.
Erigeron hybridus Hieron., Engl. Bot. Jahrb. 21: 334. 1895.
Erigeron loxensis Hieron., Engl. Bot. Jahrb. 21: 334. 1895.
Erigeron stuebelii Hieron., Engl. Bot. Jahrb. 21: 335. 1895.
Aster peruvianus (Lam.) Cabrera, Bol. Soc. Arg. Bot. 7: 234. 1959.

Remarks: In the shape of the leaves and the density of the hairiness, this is a very polymorphic species. The typical form of the species is found not only in Ecuador but also in Peru and on the Central Andes of Colombia. It has oblong, usually broadly oblong and obtuse or subobtuse leaves of about 1–1.5 cm wide; it has rather thick, woolly scapes and very woolly involucre. A divergent form is common on the Cundinamarca páramos, eastern Andes of Colombia, with linear, acute or subobtuse leaves, usually 1–2.5 mm wide, slender peduncles and glabrescent involucres with usually smaller heads. This is the variety *lineata.* At first this appears to be a distinct species, having been described as such by Hieronymus (*E. stuebelii*), but examination of abundant collections shows the existence of intermediate forms between this form and the typical *peruvianus* in Colombia and Ecuador, making impossible a sharp separation. These intermediate forms are those which have been considered in the past as different species by a few botanists following Hieronymus (*Erigeron lehmannii, E. hybridus, E. loxensis*), but the features given as differential are actually variable and of minor importance, such as the density or scarcity of the indument on scapes and phyllaries, small variation in the size of the heads, and the width of leaves, which vary from obtuse and broadly oblong to acute and lanceolate, and to narrowly linear. Another feature is the length of the tube of the ligulate corollas, which is long (2.8–3.5 mm) in the typical form and short (2–2.5 mm) in the form *lineata.* The intermediate forms have the corolla-tube variable in length and rather of the short type. In fact, all these forms are part of a large specific complex.

The collections of *E. peruvianus* are usually distributed and labeled in the herbaria as *Erigeron pellitus* (HBK) Wedd. For the first time last year, Cabrera pointed out that *Doronicum peruvianum* Lamarck, whose type specimen is preserved at the Jussieu Herbarium in Paris, is conspecific with it. Cabrera is of the opinion that this species has to be considered as *Aster,* as it was originally described by Kunth. This species certainly has a somewhat critical generic standing, but its 3–4-seriate involucre of linear and almost equal phyllaries and the narrow multiseriate rays define it as an *Erigeron.* Hieronymus distinguished his *E. stuebelii* from other related species by a silky layer that covers its leaves;

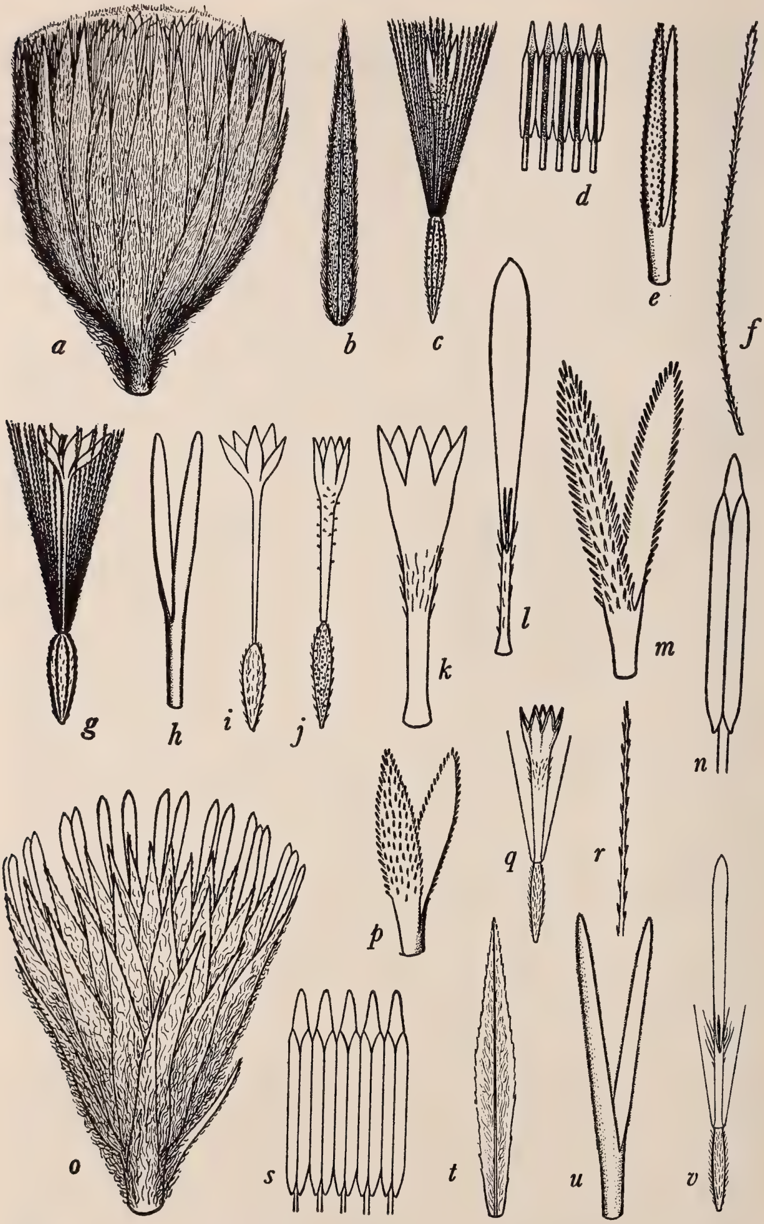
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Fig. 1.—*a–j*: *Hinterhubera nevadensis* (Cuatrecasas and Romero 24585). *a*, head, ×5; *b*, inner involucral bract, ×5; *c*, disc flower, ×5; *d*, stamens, ×15; *e*, style end of disc flower, ×25; *f*, pappus hair, ×10;

but this feature actually exists in all varieties of *E. peruvianus*. There is always a silky veil covering the very young leaves which usually separates very soon but sometimes stays on longer until complete maturity; this may happen in forms with narrow leaves but no rules can be established about the longevity of the leaf veil.

Erigeron peruvianus var. **lineatus** Cuatr., var. nov.

Folia radicalia rosulata anguste linearia basim parum angustata apice acuta mucronulata vel mutica margine valde revoluta 3–10 cm longa 1–2.5 cm lata supra velo fibroso-sericeo argentato deciduo tecta subtus crasse crispo-lanata sed costa eminentissima fibroso-sericeo tecta vagina longa dense longeque lanato-villosa. Capitulum hemisphaericum 2 cm latum. Involucrum 0.9 cm altum circa 4-seriatum, bracteis interioribus lineari-lanceolatis 8 mm longis 1 mm latis dorso hirsutulis sursum violaceis. Flores radii feminei 3-seriati circa 65; corolla 7 mm longa tubulo 2 mm longo sursum pilosulo pilis longis tenuibus, lamina oblonga subacuta 0.5 mm lata integra vel obsolete 3–2-dentata; ovarium hirsutulo-villosum; pappus stramineus uniseriatis 3.5 mm longus. Flores disci circa 46; corolla 4 mm longa tubulo 2 mm longo; antherae 1.5 mm basi breviter angustato-auriculatae; rami styli lanceolati crassiusculi longe papillosi, 1 mm longi; ovarium villosum; pappus 3.5–4 mm longus stramineus uniseriatus. (Fig. 1, *o–v.*)

Type locality: Colombia: Cundinamarca, Cordillera Oriental, Páramo de Zipaquirá, between Zipaquirá and Pacho, 3100–3200 m altitude, "ligules white or lilaceous," 16 June 1940, J. Cuatrecasas 9556. Holotype, US; Isotype, COL.

Erigeron tergoalbus Cuatr., sp. nov.

Herba humilis rosulata scapifera rhizomate verticale crassiusculo ad apicem cum vaginis foliorum crassissime tecto radicibus crassiusculis numerosis oriente.

Folia omnia basilaria rosulato-fasciculata crasse subcoriacea oblongo-linearia apice subite angustata subacuta vel subobtusa basim versus sine sensu in petiolum alatum attenuata margine integra revolutaque basi in vaginam membranaceam longam amplectentem dense longeque fulvo-villosam producta, 20–30 cm longa; limbo 14–22 cm longo 1–1.5 cm lato, petiolo 2–6 cm longo, vagina 2–3 cm longa. Lamina in valde juvenile

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g, outer female flower, ×5; *h*, style end of female flower, ×25; *i*, corolla and ovary of female flower, ×5; *j*, corolla and ovary of disc flower, ×5. *k–n*: *Erigeron tergoalbus* (Prieto, Camp P-275). *k*, disc-flower corolla, ×7.5; *l*, ray-flower corolla, ×5; *m*, style end of disc flower, ×20; *n*, anther, ×20. *o–v*: *Erigeron peruvianus* var. *lineatus* (Cuatrecasas 9556). *o*, head, ×5; *p*, style end of female flower, ×40; *q*, disc flower, ×5; *r*, fragment of pappus bristle of outer flower, magnified; *s*, stamens, ×15; *t*, inner involucral bract, ×5; *u*, style end of female flower, ×40; *v*, ray flower, ×5.

plus minusve velo fibrososericeo argenteo tecta demum supra viridis nervo medio sericeo excepto glabra sublaevisque; subtus minute indumento albo crispo-lanato densissimo compressissimo subfarinaceo obtecta sed costa bene elevata velo sericeo-argentato adpresso induta, 4–5 nervis secundariis ascendentibus prominulis utroque latere saepe conspicuis.

Scapi monocephali axillares pauci erecti folia attingentes vel paulo superantes (25–40 cm longi) striolati leviter lanuginosi vel subglabrati foliolis bracteiformibus numerosis lanceolatis basi late amplectentibus paulo lanuginosis vel glabratis 2.5–1 cm longis basi 3–2 mm latis praediti. Capitulum 2.5 cm diamitens erectum radiatum. Involucrum circa 5-seriatum bracteis subaequilongis subulatis acutis interioribus circa 11 mm longis 0.8–1 mm latis subglabris margine sursum eroso-ciliatis purpurascentibus. Flores radii feminei 3-seriati circa 120. Corolla alba 9–10 mm longa tubulo 2 mm longo leviter pilosulo lamina lineari-oblonga subacuta integra vel minutissime tridenticulata 1–3-nervia 0.5–0.7 mm lata. Rami styli lineari subulati subacuti 1.6 mm longi minute papillosuli. Ovarium oblongum compressum densiuscule villosum 3.2 mm longum. Pappus stramineus 4 mm longus pilis uniseriatis inaequilongis. Flores disci hermaphroditi circa 130. Corolla sulphurea 5 mm longa tubulo 2.5 mm longo sursum paulo pilosulo dentibus triangulari-oblongis subacutis margine incrassatis apice minute papillosis 1 mm longis. Antherae 1.8 mm longae basi breviter auriculatae. Rami styli circa 1.5 mm longi lanceolati crassiusculi usque ad basim piloso-papillosi. Ovarium oblongum 3.5 mm longum 5-costatum villosum; pappus pariter floribus femineis. Receptaculum 6 mm diamitente profunde alveolatum marginibus alveolorum undulatis. (Fig. 1, *k–n.*)

Type locality: Ecuador: "Oriente" border, prov. Azuay, crest of the Eastern Cordillera, between Oña and the Río Yacuambí, altitude 10,000–11,200 feet; "plants with pseudobulbs; leaves deep green above, white pubescent below; bracts green tipped with nigrescent-purple; ray flowers white; disc flowers pale sulfur-yellow" collected by F. Prieto in September 1945 under the direction of W. H. Camp, No. P-275. Holotype, NY.

Remarks: Erigeron tergoalbus is distinct from the closely related, polymorphic *E. peruvianus,* although it has the same habit. *E. tergoalbus* differs basically in the nature of the white indument on the underside of the leaves. This consists of a thin, compact, almost smooth layer of densely and minutely crisp hairs with a very smooth and farinose appearance. In *E. peruvianus* on the other hand, this indument is thicker and consists of long, crisp, entangled hairs. In *E. tergoalbus* the leaves are also longer, the tube of the ligulate corollas is shorter and the involucre is less hairy (almost glabrous) than in the typical form of *E. peruvianus.*

Diplostephium antioquense Cuatr., sp. nov.

Arbor 4–5 m alta ramis ultimis exfoliatis tortuosis cortice griseo ruguloso cicatricoso glabrato, ramusculis terminalibus foliosis subteretibus cinereis vel ochro-cinereis crasse dense adpresseque lanulato-tomentosis.

Folia alterna crasse subcoriacea petiolo 8–12 mm longo striolato dense lanuginoso-tomentoso supra sulcato. Lamina subelliptica utrinque attenuata basi breviter cuneata apice angustata obtusiuscula sed callosomucronulata, margine subplana leviter revoluta subintegra parte inferiore excepta dentibus callosis minutis mucroniformibus remotis praedita, 3.5–9 cm longa 1.5–4 cm lata, supra in vivo atro-luteolo-viridis siccitate griseo-viridis costa stricte impressa tomentulosa reliqua glabra vel parcissimis pilis, nervis secundariis laxo reticuloque impressis conspicuisque, subtus albida siccitate ochroleuca dense crasseque lanato-tecta, costa eminenti nervis secundariis circa 10 utroque latere patulis plus minusve conspicuis vel cum tomento velatis reticulo venorum laxo conspicuo vel infra tomentum occulto.

Inflorescentiae corymboso-paniculatae folia vix attingentes ramusculos valde foliosos terminantes, e basi foliosa ramosae, 3–7 cm longae et latae, axi robusto rigido etiam ramis mediocribus ascendentibus dense crasseque lanato-tomentosis in vivo canis in sicco ochroleucis, ramulis ultimis seu pedunculis monocephalis 10–2 mm longis vel capitulos 2–3 sessiles ferentibus; bracteis ovato-oblongis vel ovatis acutis amplectentibus extus lanatis 5–2 mm longis pedunculis subtendentibus, 1–3 circa capitulum instructis. Capitula campanulata 8–9 mm longa circa 6 mm diamitentia, radiata. Involucrum 7–7.5 mm altum tomentosum bracteis 4–5 seriatis interioribus oblongis subacutis margine scariosis eroso-subciliatis 6–6.2 mm longis circa 1.5 mm latis dorso sursum tomentellis brunneo-marginatis, ceteris gradatim brevioribus dorso albido-lanatis, exterioribus ovatis acutis 2 mm longis 1.5 mm altis. Flores radii feminei 13–21, corolla alba 5.5–6 mm longa tubulo angusto recto 3.5–4 mm longo puberulo pilis crassiusculis sparsis praedito, lamina obovato-oblonga 0.8 mm lata apice 2–3-denticulata supra papillosa; stylus corolla aequilongus ramis 0.8 mm longis complanatis dilatato-sublanceolatis intus minutissime papillosis extus grosse papillosis; ovarium oblongum 2 mm longum sparse glandulosum; pappus stramineus circa 5 mm longus pilis acutis minute strigosis sursum leviter subplumoso-dilatatis aliquis exterioribus brevioribus inaequalibus. Flores disci hermaphroditi 10–20, corolla 5 mm longa tubulo crasso 2.6 mm longo pilis crassiusculis brevibus sparsis lobis triangulari-oblongis acutiusculis margine incrassatis 1 mm longis; antherae 2 mm longae basi breviter acutiusculeque auriculata; extremitas styli 1.5 mm longa incrassato-lanceolata papilloso-pilosa in 2 ramas stigmaticas lanceolatas crassiusculas conniventes 1–1.2 mm longas fissa; ovarium oblongum 2 mm longum sparse glandulosum; pappus stramineus 5 mm longus pilis acutis quam in floribus femineis paulo crassioribus sursum magis dilatatis, exterioribus minoribus strictioribus. (Fig. 2, *a–i.*)

Type locality: Colombia: Antioquia: Medellín, Mount El Boquerón, Alto de Los Baldíos, páramo 3150 m alt.; tree 4–5 m; leaves rather thick, yellowish green, dark above, whitish beneath; branchlets of the inflorescence whitish, edge of the phyllaris brownish, ligules white; 9 April 1958 José Cuatrecasas, Manuel Llano and Gabriel Gutiérrez 24226. Holotype, US; isotype, MEDEL.

Remarks: Diplostephium antioquense is closely related to *D. denticulatum* Blake, but differs in having more flexible leaves which are shorter, attenuate towards the base, cuneate, entire or almost entire and with nervation more completely concealed by the tomentum; the heads are larger, with broader and more woolly phyllaries; the ligulate corollas have a widely obovate-oblong limb and a long tube. In *D. denticulatum* the tube of the ray-corollas is shorter (2.5–3 mm) and the limb is linear and acutely 2–3-toothed. The ovaries are more scarcely glandular in *D. denticulatum* than in *D. antioquense.* A related species from Nariño, *D. tabanense* Cuatr., differs from it by its more lanceolate, acute or subacute leaves, these usually serrate, having more crowded secondary nerves, by its larger heads, with longer and more lanceolate phyllaries, by larger, linear ray-corollas, and by longer and more slender pedicels.

Diplostephium saxatile Cuatr., sp. nov.

Arbuscula 2–6 m alta ramulis crassis dense cinereo-tomensis cicatricosis ramificatione pseudodichotoma (dichasiali), extremis dense rosulato- seu fasciculato-foliosis.

Folia alterna sessilia, lamina crassa subcoriacea sed mollia lanceolato-oblonga basi paulo attenuata subrotundata amplectentiaque apice acuta margine dimidio superiore parte serrata dentibus callosis acutis patulis brevibus 2–6 mm inter se remotis, 5–11 cm longa 1.2–2.5 cm lata, supra pallide viridis adpresse villosa, costa lata nervis secundariis visibilibus nervulis minus conspicuis, subtus spise cinereo-tomentosa pilis densis flexuosis intricatis vestita, costa crassa elevata 8–9 nervis secundariis utroque latere prominentibus valde ascendentibus marginem versus arcuato-anastomosantibus nervulis venisque recticulum minutum prominentem formantibus.

Inflorescentiae terminales confertae thyrsoideo-paniculatae basi foliosae folia vix attingentes vel paulo excedentes 5–10 cm longae e basi ramosae axi ramisque dense adpresseque cinereo-villosis, pedicellis 0.1–5 mm longis ebracteolatis, bracteis subtendentibus lineari-oblongis 1.5–0.5 cm longis 0.6–1.5 mm latis. Capitula campanulata 10–12 mm alta 8–10 mm lata heterogama sed discoidea. Involucrum campanulatum 9–11 mm altum bracteis herbaceis rigidulis violascentibus 5–6 seriatis interioribus oblongo-lanceolatis acuminatisque 8–10 mm longis 1.5–2 mm latis exterioribus ovato-oblongis et ovatis gradatim brevioribus ovatioribusque infimis 4–5 mm longis 2–3 mm latis subite acutatis omnibus nervio medio notato et marginibus subtiliter lacerato-ciliatis dorso praecipue in exterioribus pilosulis vel subglabris. Flores radii feminei ligulati 21–43 bi-tri-seriati, corolla 5.5–6.5 mm longa tubulo 3–3.5 mm longo superne papilloso-pilosulo, lamina obovato-oblonga 0.5–0.6 mm lata apice profunde tridentata dentibus linearibus 0.4–0.5 mm longis, dorso sparse papilloso-pilosula; stylus corollam satis excedens circa 7 mm longus crassiusculus ramis circa 0.8 mm longis lingulatis marginibus incrassatis minutissime papillosulis; ovarium obovato-oblongum compressum tricostatum (una costa tenerior) copiose glandulosum sparse pilosum; pappus 7 mm longus

in sicco luteus pilis inaequilongis biseriatis basi coalitis, compressis strigulosis sursum paulo dilatatis versus apicem angustatis acutis, brevioribus 4–5 mm longis strictis. Flores disci hermaphroditi 23–48, corolla lutea circa 6–7.5 mm longa parte media pilosula, tubo 3–4.5 mm longo limbo tubuloso-infundibuliformi dentibus 1 mm longis triangulari-oblongis subacutis apice papillosulis; antherae 2 mm longae saccis basi obtusis vel brevissime auriculatis; rami styli 0.8 mm longi lingulato-oblongi (sublanceolati) acutiuscculi extus marginibusque longe denseque papilloso-pilosi; pappus 8 mm longus corollam valde excedens in sicco luteolus pilis inaequi-longis pariter floribus femineis; ovarium 2.5–4 mm longum lineare compressum bicostato-marginatum copiose glandulosum sterile. Receptaculum circa 2 mm diamitente alveolatum marginibus crasse membranaceis obtuse dentatis. (Fig. 2, *j–z.*)

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta; southeastern slopes: Hoya del Río Donachuí, between Laguna Esacuriba and the big rocks about 3870 m altitude; rocky páramo 4043–3870 m alt.; "tree 2–6 m; leaves soft, light green above, cinereous beneath; involucre violaceous; corollas yellow," 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24620. Holotype, US; isotype, COL.

Remarks: Diplostephium saxatile, strikingly different from the other species of the genus, is a small páramo or subpáramo tree with typical firm, medium-sized, lanceolate, sessile leaves clustered at the end of dichotomic branches. It is also strongly characterized by the small ray-corollas which are much shorter than the styles and the pappus. The short ray-corollas are found only in one other species of *Diplostephium,* namely, *D. anactinotum* Blake. This is also a remarkable endemic of the Sierra Nevada de Santa Marta and is represented by small, dwarf shrubs with small, thick, coriaceous leaves. *D. saxatile* has campanulate, rather large heads with usually a few more female than hermaphroditic flowers; its common proportion is 22 to 25 but some heads can bear twice as many as the regular ones.

Paragynoxys undatifolia Cuatr., sp. nov.

Arbor 6 m alta trunco medulloso recto basi 12 cm diamitente cortice resinoso superne tomentoso, simplex vel candelabriformis 3–5 ramis dense crasseque ochraceo-lanato-tomentosis extremo conferte subrosulato-foliosis deorsum cicatricibus foliorum semi-amplectentibus glabris signatis.

Folia magna alterna crasse coriacea valde convexo-undata. Petiolus validus circa 20 cm longus 12–16 cm crassus striatus leviter verruculosus basi vaginato-dilatatus amplectens dense crasseque ochraceo-lanato-tomentosus. Lamina subovato-elliptica apice attenuata obtusaque basi profunde cordata margine integra sed leviter irregulariterque undulata 50–70 cm longa 28–40 cm lata sinu basali asymmetrico 3–9 cm profundo, supra costa dense lanato-tomentosa cetera juvenili lanato-floccosa mox glabrata, luteolo-viridis nitens sublaevis sed bullato-undata, nervis secundariis conspicuis reliquis obsoletis, subtus dense crasseque ochraceo-tomentoso-lanata, costa crassa valde eminenti nervis secundariis 14 vel

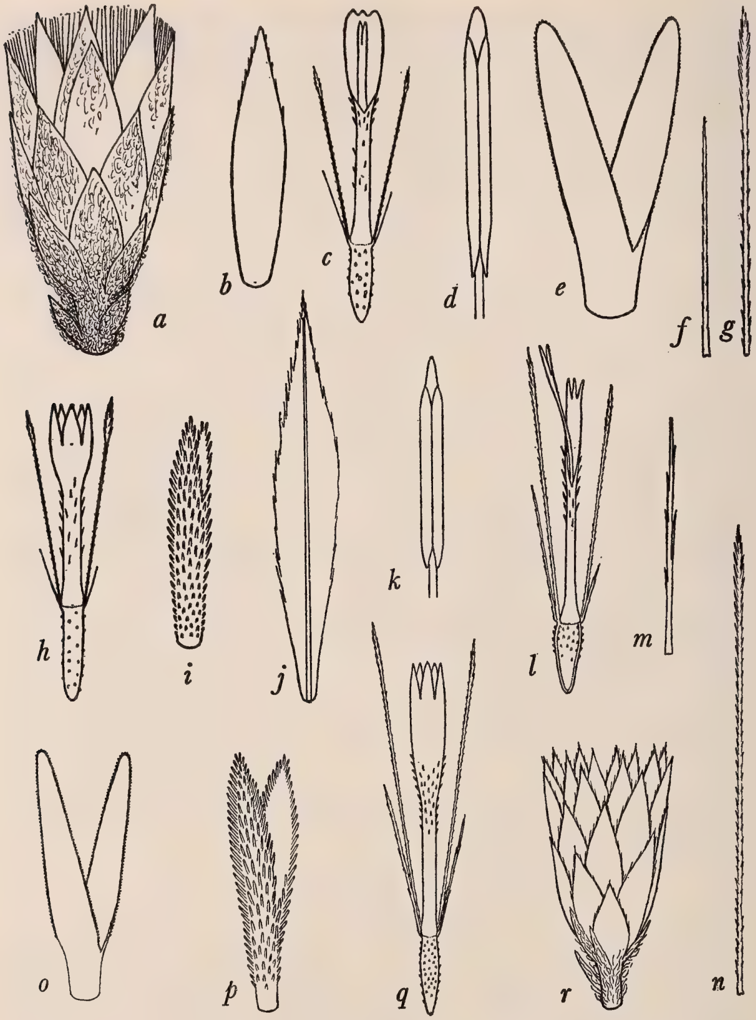


Fig. 2.—*a–i*: *Diplostephium antioquense* (Cuatrecasas et al. 24226). *a*, head, ×5; *b*, inner involucral bract, ×5; *c*, ray flower, ×5; *d*, anther, ×15; *e*, style end of female flower, ×40; *f*, outer pappus bristle of disc flower, ×15; *g*, fragment of inner pappus bristle of disc flower, ×10; *h*, disc flower, ×5; *i*, style end of disc flower, ×20. *j–r*: *Diplostephium saxatile* (Cuatrecasas and Romero 24620). *j*, inner involucral bract, ×5; *k*, anther, ×15; *l*, ray flower, ×5; *m*, outer pappus bristle of disc flower, ×10; *n*, inner pappus bristle of disc flower, ×7.5; *o*, style end of ray flower, ×30; *p*, style end of disc flower, ×30; *q*, disc flower, ×5; *r*, involucre, ×5.

15 utroque latere prominentibus patulis marginem versus ramoso-furcatis anastomosantibus, nervis tertiis reticulo laxo prominenti instructis venulis reticulatis prominulis sed cum indumento cancellatis. Folia valde juvenilia brevia utrinque crasse denseque crispo-lanata.

Inflorescentiae magnae thyrsoideo-paniculatae axillares 50–60 cm longae 30–60 cm latae pedunculo robusto striato dense ochraceo lanato sparse leviterque verruculoso circa 25 cm longo, ramis numerosis crassis paulo flexuosis striolatis ochraceo-lanatis bracteis subtendentibus linearibus 3–7 cm longis crasse villoso-lanatis; bracteis inferioribus foliaceis 10–20 cm longis 5–7 cm latis. Pedicelli teneri 4–15 mm longi 5–6-bracteolati bracteolis anguste subulatis teneris flexuosis 5–8 mm longis circa 0.5 mm latis. Ramusculi pedicelli bracteolaeque lanuginosi-villosi pilis longis capillaribus intricatis flexuosis. Capitula homogama discoidea 5-flora. Involucrum cylindraceum 8–8.5 mm altum circa 4 mm diamitens 5 bracteis chartaceis plus minusve violascentibus oblongis 8–8.5 mm longis apice subacutis ciliatisque, externis circa 2 mm latis intus 6–7-nervatis internis margine scariosis 3–3.5 mm latis intus 3–4-nervatis, margine eroso-ciliatis dorso sparse villosis vel glabratis. Flores omnes hermaphroditi, corolla alba glabra 11 mm longa tubulo crassiusculo 5.5–6 mm longo laciniis linearibus 5 mm longis 0.6 mm latis marginatis 1-nervatis apice acuto minute papilloso. Antherae maturitate exsertae 3 mm longae basi breviter sagittatae acute auriculatae fertiles. Stylus exsertus ramis 3 mm longis contortis crassiusculis subacutis subcomplanatis supra canaliculatis papillosulis sursum extus papilloso-pilosis apice acute panicillatis. Ovarium glabrum 3 mm longum subtriangulare compressum 10-striatum. Pappus stramineus 8 mm longus setis crassiusculis rigidis minute strigulosis numerosis 2–3-seriatis persistentibus basi in brevem annulum achaenium coronantem coalitis. Receptaculum planum leviter 5-foveolatum 1 mm diamitente.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slope: Hoya del Río Donachuí, below Sabanita Diricune, near Col., 3200 m altitude, "tree 6 m high, leaves rigid, coriaceous, bullate, yellowish green above, ochraceous green beneath, corolla white, styles light yellow," 29 September 1959, J. Cuatrecasas and R. Romero-Castañeda 24485. Holotype, US; isotype, COL.

Remarks: Paragynoxys undatifolia is closely related to *P. meridana* Cuatr., but it can be distinguished by its thicker coriaceous leaves, which are more elliptical or oblong, convex and strongly waved, smooth without prominent reticulum on the upper side, and covered beneath with thicker woolly indument of very long, intricate hairs. The petiole, midribs and inflorescence-branches are sparsely and obsoletely verrucose. The flowers are always hermaphrodite, and the corolla tube is equal to or longer than the limb. *P. meridana,* on the other hand, has ovate, flat and less thick leaves with prominent reticulum above, and dense but shorter lanate tomentum beneath and on the petioles. In addition, *P. meridana* has very conspicuously verrucose petioles, midribs and inflorescences. Female flowers often develop through abortion of the anthers. The corolla tube

(4–5 mm) is shorter than the lobes (6 mm). The flowers also have a longer pappus than those of the new species.

Of this striking genus eight species were known (see Cuatrecasas in Brittonia 8: 151–160, 1955), each endemic to a restricted area in the Sierra Nevada de Merida, Venezuela, and eastern Andes and Antioquia in Colombia. *P. undatifolia* is an uncommon small tree found in bushy or rocky protected places in the subpáramos or inside the Andean forest on the southern slopes of the Sierra Nevada de Santa Marta. I have seen it between 2500 and 3200 m altitude; inside the forest it may reach a height of 12 m. The pith of the stem is rather soft and I found it to be edible and palatable.

Senecio doryphyllus Cuatr., sp. nov.

Suffrutex 0.2–1 m alta ramis flexuosis striatis inferne cicatricosis, juvenilibus valde foliosis arachnoideis demum glabris plus minusve violaceis.

Folia alterna saepe patentia crassiuscula, lamina oblongo-lanceolata acuta vel acuminata margine leviter revoluta calloso-dentata basi in petiolum valde brevem vel in ramis adultis elongatisque ad 2 cm longum petiolum angustata, in supremis sessilia 3–15 cm longa 0.3–2 cm lata, basi late amplectente vaginata seu brevissime auriculata, utrinque juvenilis arachnoidea denique glabrata, supra atroviridis costa angusta notata reliqua sublaevis sed nervulis reticulatis impressis plus minusve visibilibus, subtus costa prominenti nervis secundariis circa 20 utroque latere conspicuis tenuibus patulis et cum venulis in reticulum laxum anastomosatis, superficie viridis nervis violaceis.

Inflorescentiae terminales paniculatae ad 20 capitulos ferentes (vulgo 8–10), ramis ramulisque tenuibus patulis violascentibus primum arachnoideis deinde glabratis, basi foliosis, foliis cum caulinis similibus sed sessilibus amplectentibus, sursum gradatim minoribus supremis in bracteis linearibus subulatis 20–5 mm longis 1–0.6 mm latis commutatis. Pedicelli 1–3 cm longi teneri bracteolati apice plurimis bracteolis lanceolatis acuminatisque parce arachnoideis vel glabris 3.5–6 mm longis calyculum formantibus. Capitula homogama campanulata 1.2–1.5 cm longa et lata saepe cernua vel nutantia. Involucrum herbaceum circa 1 cm altum 14–21 bracteis crassiusculis oblongo-lanceolatis apice ciliatis reliquis glabris 7.5–9 mm longis 1.5–2.8 mm latis exterioribus anguste interioribus late membranaceo-marginatis sursum purpurascentibus. Flores omnes hermaphroditi 56–100, corolla lutea 7–9.5 mm longa glabra tubulo angusto 4–5 mm longo limbo tubuloso paulo ampliato, dentibus triangularibus acutis apice leviter incrassato minutissime papilloso 0.8 mm longis. Antherae 2.5 mm longae basi brevissime vel obsolete auriculatae. Rami styli crassiusculi 1.2 mm longi curvati apice truncati penicillati et saepe piloso-caudati. Ovarium glabrum 1.8 mm longum. Pappus albus 7–9 mm longus pilis sericeis tenuibus strigulosis 2–3-seriatis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí; between Laguna Esacuriba and the big rocks about 3870 m altitude; rocky páramo 4043–3870 m alt., "undershrub 0.3–1 m high, branches flexuose; leaves soft, dark green above, lighter with violaceous veins beneath; branchlets more or less violaceous; involucral bracts rather dark or purplish at tip; corollas yellow"; 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24618. Holotype, US; isotype, COL.

Remarks: Senecio doryphyllus belongs to the section *Aetheolena* (Cass.) Hoff., being closely related to S. *patens* (HBK) DC. and S. *cuencanus* Hieron. It can be distinguished by its firm, narrowly lanceolate and dentate leaves, by its broadly oblong-lanceolate phyllaries, and by the deciduous arachnoid (not woolly or tomentose) indument of young leaves and branchlets which, when adult, are glabrous. The Venezuelan S. *longipenicillatus* Sandwith is also related to it, but differs primarily by being densely tomentose. S. *doryphyllus* varies in the size of the leaves, inflorescences and flowers according to environmental conditions. In open places, the plants may develop smaller, densely arachnoideous leaves and more compact inflorescences; under protection and in the shade of large rocks and tall shrubs, the branchlets become elongate, the leaves larger, and the inflorescences larger, spreading and looser. There is also a degree of variation in the size of heads and, accordingly, in the size and number of phyllaries and flowers.

Senecio harrietae Cuatr., sp. nov.

Suffrutex 1–2 m alta caulibus foliosis erectis anguloso-striatis violaceis villosulis pilis brunneis longis subadpressis vel plus minusve flexuosis.

Folia alterna crassiuscula sessilia lanceolata vel lineari-lanceolata apice acuta calloso-mucronulata basim versus angustata basi subite dilatato-auriculata amplexicaulia margine revoluta breviter repandoque denticulata dentibus minutis callosis 3–8 mm distantibus, 2–8 cm longa 4–13 mm lata auriculis semirotundatis 2–10 mm latis, supra pallide viridia juvenilia dense deinde sparse villosa pilis fuscis longis basi incrassatis subadpressis leviterque flexuosis, costa impressa ceteris nervis obsoletis, subtus pallidiora magis villosa costa prominenti nervis secundariis acute ascendentibus 6–8 utroque latere conspicuis reliquis nervis inconspicuis.

Inflorescentia terminalis floribunda corymboso-paniculata folia valde superans, 8–12 cm lata ramis ramulisque violaceis angulato-striatis brunneo-villosis inferne e foliis subtendentibus superne bracteis gradatim brevioribus linearibus et subulatis villosulis 10–4 mm longis. Pedicelli teneri flexuosi vel erecti 3–15 mm longi villosuli plus minusve bracteolati ad apicem 6–8 bracteolis subulatis villosis 3–4 mm longis ad modum calyculi laxi. Capitula heterogama semiglobosa radiata circa 12 mm diamitentia. Involucrum campanulatum 5–6 mm altum, 13 bracteis herbaceis viridibus brunnescenti-villosulis sublanceolato-linearibus acutiusculis circa 5 mm longis apice ciliatis margine integris, exterioribus 1.2–1.5 mm latis interioribus late scarioso-marginatis 1.8–2 mm latis. Receptaculum nudum alveolatum. Flores radii feminei ligulati 13, corolla lutea glabra patenti 8 mm longa tubulo 2.3 mm longo lamina elliptico-oblonga 5-nervata 1.5–1.8 mm lata apice minute 3-denticulata; ramuli

styli 1 mm longi tubuli corollae paulo exserti lineari minutissime papillosi apice subtruncati papillosuli; ovarium 1 mm longum ellipsoideo-oblongum 5-costatum glabrum; pappus sericeus albus 2.8–3 mm longus pilis inaequilongis biseriatis minute strigulosis basi coalitis. Flores disci hermaphroditi 32–44, corolla tubulosa glabra lutea 4.6 mm longa tubulo 1.5 mm longo limbo tubuloso-infundibuliformi dentibus triangulari-oblongis 0.6 mm longis subacutis apice papillosis; antherae 1.2 mm longae sagittatae caudis 0.15 mm longis; filamenta extremo in 0.5 mm longitudine incrassata; rami styli 1 mm longi crassiusculi paulo complanati apice subtruncati breviter papilloso-piloso-coronati; ovarium 1.2 mm longum glabrum acute 5-costatum; pappus 3 mm longus albus sericeus pilis biseriatis minute strigilosis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, headquarters of Río Sevilla, western slopes of the Sierra, in river canyon below camp at an altitude of 3400 m, January 1959, Harriet Barclay 6690. "Shrub to 2 m tall; stem dark red-purple to green with dark hairs; leaves auricled with branch above each leaf; leaves dark green above, lighter below, revolute, brown hairs on both sides; small heads with yellow rays; involucral bracts margined with brown, tipped with hairs; disc flowers yellow." Holotype, US.

Remarks: Senecio harrietae is somewhat similar to S. *subarachnoideus* Sch. Bip., from the northern slopes of the Sierra Nevada, but the latter has almost coriaceous, obtuse leaves dentate only at apex, large heads, and another kind of indument. The natural affinities of S. *harrietae* are toward S. *pectioides* Rusby, from the Bolivian Andes, from which it differs by the villous and loose nature of the indument, its smaller heads and flowers, the shorter and wider involucral bracts, and by other differences in the shape of the leaves.

Senecio favillosus Cuatr., sp. nov.

Suffrutex 1 m alta ramis flexuosis scandentibus argute striatis tomento subadpresso lanato-arachnoideo albo-cinereo tectis.

Folia alterna subcoriacea crassiuscula. Petiolus 5–12 mm longus lanuginoso-arachnoideus cinereus. Lamina ovato-lanceolata basi obtusa apice attenuata obtusiuscula vel subacuta minute calloso-mucronata margine remote serrulata dentibus callosis 2–5 mm distantibus, 3–8 cm longa 1.3–4 cm lata, supra juvenilis dense lanuginoso-arachnoidea subargentea deinde subglabrata sparse arachnoidea viridis laevis costa nervisque secundariis paulo conspicuis, subtus juvenilis albo-argentata dense induta deinde cinerea indumento lanato-arachnoideo mucido tecta costa eminenti nervis secundariis 5–7 utroque latere ascendentibus marginem versus curvatis evanescentibus vel anastomosatis nervulis inconspicuis vel laxo reticulo leviter notato.

Inflorescentiae paniculatae breves 3–7 cm longae ramulos breves terminantes folia paulo superantes, pedunculo ramulisque cinereo-arachnoideo-lanatis bracteolis subulatis circa 8–5 mm longis 1–0.5 mm latis lanato-cinereis. Pedicelli 2–5 mm longi cinereo-lanati paucis bracteolis subulatis 3–4 mm longis 0.5 mm latis flexuosis instructi. Capitula subglobosa parva homogama circa 7–8 mm alta lataque. Involucrum cupulatum 5 mm altum 11–13 bracteis herbaceis ovato-lanceolatis acutis vel paulo acuminatis crassiusculis 4.5–5 mm longis, exterioribus haud vel anguste scarioso-marginatis uno latere 1–1.8 mm latis, interioribus marginibus late scariosis 2–2.5 mm latis, dorso apiceque albo-lanatis. Calyculum 5–6 bracteolis subulatis flexuosis 3.5–4 mm longis 0.5 mm latis basi capituli apiceque pedicelli. Flores omnes hermaphroditi 55–58 in capitulo, corolla tubulosa lutea 5 mm longa glabra tubulo 2 mm longo limbo infundibuliformi 5-lobato lobis oblongis subacutis 0.8–0.9 mm longis apice minute papillosulis. Antherae 1 mm. longae basi sagittatae caudatae, caudae 0.2 mm longae. Rami styli curvati 0.8 mm longi crassiusculi subcomplanati minutissime papillosi apice subtruncati papillosi breviter coronato-penicillati. Ovarium 1.5 mm altum 5-costatum glabrum. Pappus albo-sericeus 4 mm longis setis subbiseriatis scabris deciduis.

Type locality: Colombia: Magdalena: Cordillera Oriental: Serranía de Perijá, Corregimiento de Manaure: Sabana Rubia, "bosque dentro del páramo," 2700 m alt., 5 March 1959, R. Romero Castañeda 7449. Holotype, US; isotype, COL.

Remarks: Senecio favillosus is a subshrub with spreading or climbing branchlets, which superficially resembles some members of the section *Streptothamnus* Greenm., but actually it has no close relationship to any other species of Andean *Senecio.* It is distinguished by its discoid, rather small heads and by its subappressed, woolly-arachnoid, cinereous tomentum covering branchlets, inflorescences and the ovate-lanceolate, not reticulate, leaves.

Senecio romeroi Cuatr., sp. nov.

Herba 60–90 cm alta radice tenui caule simplici erecto robustiusculo striato indumento albo arachnoideo deciduo tecto.

Folia basilaria rosulato-fasciculata 10–12 crasse herbacea longe petiolata. Petiolus 10–18 cm longus 2–3 mm latus striatus arachnoideolanuginosus sursum anguste marginatus basi breviter amplectente vaginatus vagina submembranacea nervata circa 1 cm longa lataque. Lamina elliptico-oblongissima, 12–20 cm longa 1.8–3.5 cm lata, basi subite cuneato-attenuata plus minusve cum petiolo decurrens apice paulo attenuata obtusa, margine leviter revoluta vel adulta plana dentata dentibus callosis 0.5–1 mm eminentibus 2–4 mm inter se distantibus, supra atro-luteolo-viridis in juvenilibus sparse arachnoidea demum glabra costa conspicua nervis secundariis 12–14 utroque latere curvato-ascendentibus tenuibus cum reticulo impresso leviterque conspicuo anastomosatis, subtus albo-cinerea tomento lanato denso tecta tantum costa plus minusve glabrata prominenti relqius nervis occultis vel leviter notatis. Folia caulina numerosa alterna, inferiora cum basilaribus similia sed sursum petiolo gradatim breviori latiorique et lamina magis decurrenti, media sessilia oblonga cordato-amplectentia 20–14 cm longa, suprema lanceolata acutiuscula basi cordata amplectenti 14–8 cm longa 1.6–1.8 cm lata.

Inflorescentia corymboso-paniculata circa 15 cm longa et lata 25–30 capitulis ramis erectis striatis arachnoideis bracteis lanceolatis subtus albo-cinereo-lanatis inferioribus foliaceis 5–6 × 1 cm sursum gradatim minoribus supremis linearibus acutis 8–5 mm longis 1.5–1 mm latis. Pedicelli 5–2.5 cm longi recti erecti sparsis bracteolis linearibus muniti. Capitula radiata erecta 3–3.5 cm diamitentia. Involucrum campanulatum circa 1 cm altum 1 cm diamitente 32 bracteis subbiseriatis herbaceis viridibus lineari-lanceolatis acutis 8–9 mm longis dorso crassis, externis 1–1.2 mm latis margine anguste scariosis, internis 1.5–2 mm latis margine late scariosis, glabris apice ciliato-penicillato excepto. Calyculum breve 14–16 bracteolis lineari-lanceolatis acutis 4–5 mm longis glabris vel parce arachnoideis ad apicem pedicelli imbricatis dimidium involucri non attingentibus. Flores radii feminei ligulati circa 17, corolla lutea 16–18 mm longa tubulo subcapillari 7–7.5 mm longo sursum parce puberulo, lamina oblongo-elliptica apice minute 3-denticulata circa 8-nervata saepe 4 nervis conspicuioribus 9–10 mm longa 3–5 mm lata; rami styli vix exserti 1 mm longi lineares subobtusi minutissime papillosi; ovarium glabrum 1.2 mm longum; pappus albus circa 7 mm longus pilis sericeis tenuibus minute scabrosis pluriseriatis. Flores disci hermaphroditi circa 140, corolla tubulosa lutea glabra 8 mm longa tubulo subcapillari 4 mm longo limbo tubuloso 5-nervato 5-dentato dentibus oblongo-triangularibus 0.6 mm longis apice incrassatis minute papillosis; anthaerae 1.5 mm longae basi brevissime auriculatae; rami styli 1 mm longi crassiusculi minute papilllosi supra sulcati apice truncati papilloso-pilosi; ovarium glabrum 1.5 mm longum striolatum; pappus 7 mm longus sericeo-albus pilis tenuibus pluriseriatis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí, páramos near Meollaca, about 3560–3500 m altitude; "herb 60 cm, leaves rather thick, soft, dark yellowish green above, cinereous beneath; petioles and midribs violaceous; involucre green; ligules and florets yellow," 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24622. Holotype, US; isotype, COL.

Remarks: Senecio romeroi is closely allied to *S. folidentatus* Cuatr., from which it differs by its narrower, oblong, almost linear, obtuse basal leaves, with shorter and more obtuse dentation, the whitish, lanate tomentum that covers the leaves beneath, the longer calyculus (attaining half the length of the involucre), and by the higher number of phyllaries (32 in *S. romeroi,* 20 in *S. folidentatus*). The same features may distinguish *S. romeroi* from the Venezuelan *S. funckii* Sch. Bip. This Venezuelan species, furthermore, differs by its shorter ovate-elliptic, cordate basal leaves; the rosette-leaves of *S. funckii* were unknown by Schultz Bipontinus and also by Weddell, who wrote in Chloris Andina 1:125, 1855, "inferioribus petiolatis s. valde angustatis." These words probably refer to the lower leaves of the stem and not to the rosular leaves. Rosette leaves are present in specimens of later collections now preserved at the U.S.N.M. (Jahn 1130, Aristeguieta 2640, etc.), allowing a more complete concept of S. *funckii.*

Senecio rugosus Cuatr., sp. nov.

Frutex scandens ramis strictis tortuosis striolatis viridibus juvenilibus albo-lanuginosis demum glabratis, ramulis ultimis valde divaricatis seu reflexis.

Folia alterna subcoriacea rugosa petiolo 1–2 cm longo albo-lanato supra sulcato basi biauriculato vaginato amplexicauli auriculis suborbicularibus 3–10 mm latis, lamina oblongo-ovata vel subovato-lanceolata basi obtusa apice attenuata subacuta vel acuta calloso-mucronulata, margine leviter revoluta subintegra, 3–7 cm longa 1.1–3.6 cm lata, supra rugoso-nervata saepe bullata dilute lanuginosa vel glabrata luteolo-viridis nitidaque costa angusta impressa reliquis nervis impressis reticulatis, subtus in vivo albido-lanata in sicco viridi-flavescenti vel ochroleuca indumento crispo lanato tecta costa valde eminenti nervis secundariis 6–8 utroque latere curvato ascendentibus prominentibus cum nervulis prominentibus laxe reticulatis anastomosatis.

Inflorescentiae dichotomo-paniculatae ad ramos ultimos breves pseudo-paniculam foliosam compositam formantes; ramuli divaricati albido-lanuginosi 1–3 cm longi basi foliosi sursum bracteis linearibus vel subulatis 5–3 mm longis albatis; pedicelli 0.1–3 mm longi lanati parcis bracteolis aliquando 1–3 capitulis sessilibus instructis. Capitula homogama parva campanulata 7–8 mm longa 6 mm lata. Involucrum cupulatum 4–4.5 mm altum, bracteis 8 raro 9–10 crassiusculis ovatis et lance-ovatis acutis extus albo-lanatis 3–3.5 mm longis, exterioribus circa 1 mm latis magis acuminatis, interioribus margine late scariosis 1.7–2 mm latis. Calyculum 3–4 bracteolis subulatis flexuosis lanuginosis 3–3.5 mm longis ad basim capituli apicemque pedicelli. Flores omnes hermaphroditi 21–28 in capitulo, corolla tubulosa lutea 5 mm longa glabra tubulo 1.6 mm longo limbo tubuloso-infundibuliformi dentibus linearibus subacutis ad apicem leviter incrassatis, circa 1.3 mm longis. Antherae 1.5 mm longae basi longe caudatae caudiculis subulatis tenuibus 0.3–0.4 mm longis. Rami styli crassiusculi 1.2 mm longi minute papillosuli apice truncati papilloso-penicillati saepe piloso-caudati. Ovarium leviter striatum glabrum 1 mm longum. Pappus albo-sericeus 4.5 mm longus pilis breviter strigulosis 2–3-seriatis. Receptaculum circa 1.5 mm diamitens alveolatum marginibus argute elevato-dentatis.

Type locality: Colombia: Magdalena: Cordillera Oriental, Sierra de Perijá east of Manaure at Quebrada de Floridablanca, in bushes and Andean forests, 2700–2800 m alt.; "climbing undershrub; leaves subcoriaceous, rugose, yellowish green above, whitish beneath; involucre light green; corollas yellow," 10 November 1959, José Cuatrecasas and Rafael Romero Castañeda 25180. Holotype, US; isotype, COL.

Remarks: Senecio rugosus, somewhat resembling *S. bullatus* Benth., is unique among the Andean climbing species of the genus by its strongly rugose, auriculate leaves and small heads.

Chaptalia incana Cuatr., sp. nov.

Herba rosulata scapigera lana alba plus minusve dense obtecta, rhizomate tenui obliquo fibroso-radicifero.

Folia omnia basilaria rosulato-fasciculata lineari-oblonga vel lanceolato-linearia crasse subcoriacea rigidula subapicem attenuata apice calloso-mucronulata basim versus sine sensu in brevem petiolum angustata basi subite in longam vaginam scariosam amplectentem araneoso-lanatam ampliata, margine revoluto dentibus callosis mucroniformibus remotis (6–10 mm distantibus) munita, 5–14 cm longa 4–12 mm lata, vagina 3–4 cm longa 0.8–0.9 cm lata, limbo supra albo-arachnoideo-lanato aliquando vetusti glabrato viridique laevi enervato, subtus dense crasseque candido-lanato tantum costa promineti.

Scapi floriferi axillares solitarii (1–3 in roseta) tenues erecti monocephali dense albo-lanati 7–26 cm longi, juveniles folia attingentia vetustiores valde superantes, bracteis lineari-subulatis flexuosis 10–7 mm longis 1–0.5 mm latis lanuginosis inferne remotissimis sursum numerosis basi capitulum cum involucro subimbricatis muniti. Capitula erecta vel reclinata campanulata radiata 2–2.5 cm alta. Involucrum basi conicum, bracteis 4–5 seriatis imbricatis herbaceis rigidulis plus minusve purpurascentibus interioribus fertilibus circa 12 uniseriatis sublanceolato-linearibus acutis integerrimis, dorso albo-lanuginosis, costa eminenti margine basique scariosis 17–22 mm longis 2–2.5 mm latis, bracteis exterioribus gradatim brevioribus angustioribusque et magis acutis, inferioribus 7–9 mm longis sine sensu et cum bracteolis pedunculi imbricatis descendentibus. Flores marginales feminei ligulati uniseriati 17–21 involucrum excedentes; corolla glabra 14–16 mm longa lamina supra alba subtus lilacina oblonga 3-dentata nervis 4 paulo visibilibus 1.6–1.8 mm lata tubulo subcapillari 5–6 mm longo basi lamina saepe 2 dentibus brevibus munita; rami styli anguste lineares obtusi glabri supra margineque minutissime papillosi; ovarium lineare sursum subrostrato-angustatum glabrum compressum submarginatum; pappus flavo-stramineus 7 mm longus pilis triseriatis minute strigulosis basi in annulo connatis. Flores feminei interiores biseriati 10–16 tubulosi; corolla glabra 6.5–7 mm longa imperfecte bilabiata, tubulo subcapillari apice limbo 1–1.2 mm longo labio exteriori breviter ligulato tridentatoque interiori 2-dentato vel tubo apice valde oblique 5-dentato; stylus ovarium pappusque cum floribus ligulatis similes. Flores disci hermaphroditi 14–25 bilabiati; corolla 9–10 mm longa basi 4 mm longe tubulosa cetera gradatim ampliata, limbo bilabiato labio exteriori 2.5 mm longi 3-dentato dentibus acutis circa 0.8 mm longis interiori in 2 lacinias lineares revolutas partito; antherae 3.5 mm longae basi longe caudatae (caudae 0.8 mm longae); styli rami crassiusculi subspathulati obtusi 0.8 mm longi sursum apiceque breviter crasseque pilosulo-papillosi; ovaria sublaevia subcompressa bimarginata et 3 costis tenuissimis fere inconspicuis. Achaenia non evoluta. Receptaculum nudum foveolatum. (Fig. 3, *k–w.*)

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí: Meollaca (or Meuyaca),

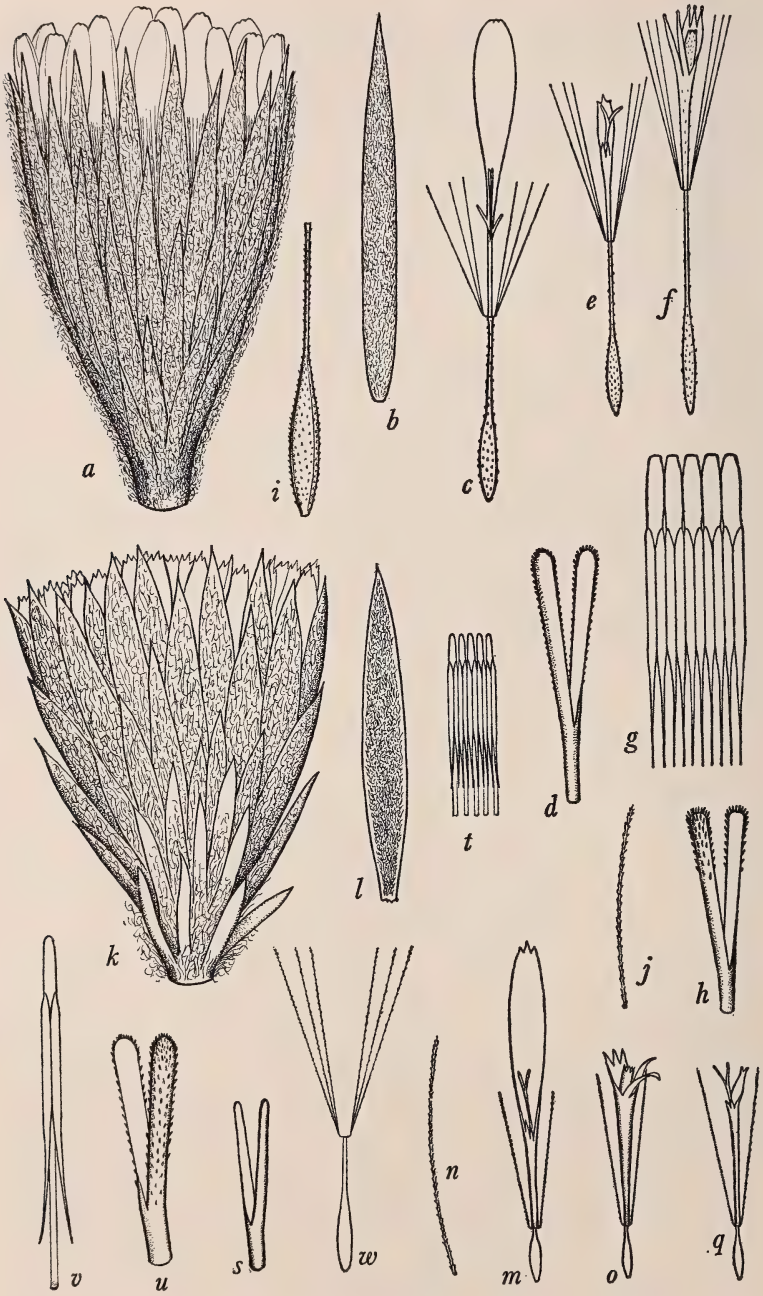
páramo, bushy prairies 3320–3260 m alt.; ligules white above, lilaceous beneath; 28 September 1959, J. Cuatrecasas and R. Romero Castañeda 24438; Holotype, US; isotype, COL. Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí: Laguna de Calocribe, east of Meollaca, páramo 3600–3700 m alt.; leaves greenish above, white beneath; involucral bracts green purplish; ligules white above, ± violaceous beneath 30 September 1959, J. Cuatrecasas and R. Romero Castañeda 24549; paratypes, US, COL.

Remarks: Chaptalia incana must be placed in the section *Leria* (DC.) Burkart. It differs from all other species chiefly by its narrow-linear white-woolly leaves and its general white tomentum. The shape of its heads and of its three kinds of corollas distinguishes *Chaptalia incana* from other species which may have somewhat similar leaves (such as *Ch. runcinata* var. *graminifolia* (Dus.) Burkart).

Chaptalia paramensis Cuatr., sp. nov.

Herba rosulata scapigera rhizomate inclinato fibroso-radicifero. Folia omnia basilaria alterna petiolata subcoriaceo-herbacea crassiuscula, petiolo 2–7 cm longo crassiusculo striato ochroleuco vel griseo-lanato basi subite in vaginam scariosam amplectentem circa 1 cm longam et latam dilatato; lamina ovoidea vel oblongo-ovoidea apice obtusa vel paulo attenuata basi plus minusve inaequilatera subcordata vel truncata aliquando leviter subiteque decurrens margine leviter grosse dentata 3–8 cm longa 2.5–5 cm lata, supra juvenilis indumento arachnoideo-lanato ochroleuco deciduo adulta glabrata atroviridis nervis secundariis tenuibus paulo conspicuis, subtus dense crasseque ochroleuco- vel griseo-lanata costa eminenti nervis secundariis circa 5 utroque latere bene ascendentibus plus minusve conspicuis.

Scapi axillares singuli monocephali 15–26 cm longi suberecti crassiusculi ochroleuco-lanati ebracteati ad apicem incrassati saepe deflexi. Capitula radiata campanulato-conica 20–25 mm alta cernua vel nutantia. Involucrum turbinatum bracteis imbricatis 6-seriatis subherbaceis lineari-lanceolatis acutis margine scariosis plus minusve violaceis dorso lanatis, interioribus 20 fertilibus 20–21 mm longis 2–2.5 mm latis reliquis gradatim brevioribus exterioribus 6–4 mm longis 1–0.7 mm latis. Flores radii feminei 22–33 subuniseriati; corolla alba glabra ligulata subbilabiata 15–16 mm longa ligula oblonga 2 mm lata oscure 4-nervata apice attenuata integerrima vel minute 2–3-denticulata basi 2 dentibus linearibus 0.6–0.7 mm longis praedita, tubulo subcapillari 5–5.5 mm longo; rami styli tubulum superantes lineares obtusiusculi supra minute papillosi; ovarium fusiforme subcompressum bimarginatum sparse minuteque pilosulum 3.5 mm longus apice rostrum filiformen 4–4.5 mm longum productum; pappus stramineus 6–7 mm longus pilis breviter strigulosis triseriatis. Flores feminei interiores 35–45, corolla brevi subbilabiata 9–9.5 mm longa tubulo angusto 5–5.5 mm longo labio exteriori ligulato lamina 3.5 mm longa 0.6 mm lata apice tridentata interiori brevi 2 laciniis brevibus saepe inaequalibus 0.5–0.7 mm longis instructo; rami styli 1.5–2 mm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longi lineares obtusi supra minute papillosi; ovarium 4.5–5 mm longum fusiforme subadpressum bimarginatum apice rostratum minutis pilis sparsis praeditum. Flores disci hermaphroditi circa 41 tubuloso-zygomorphi; corolla 9–9.5 mm longa bilabiata, tubulo circa 4 mm longo sursum in limbum tubulosum sine sensu ampliatum producto, labio exteriori oblongo 2-nervato circa 3 mm longo 1.3 mm lato apice profunde tridentato labio interno in 2 lacinias lanceolato-lineares 2.5–3 mm longas partito, apice dentibus laciniisque capitato-incrassatis papilloso-glandulosis; antherae sagittatae 4.5 mm longae appendicibus apicalibus obtusis 1.4 mm longis ad basim caudiculis subulato-filiformibus circa 1.5 mm longis. Rami styli lineares crassi 1 mm longi ad apicem rotundati papilloso-pilosi intus minutissime papillosuli; ovarium tenue cum rostro circa 9 mm longum, sparse minuteque pilosulo; pappus stramineus 8–9 mm longus pilis tenuibus rigidis minute strigulosis 3-seriatis. Achaenia inmatura subfusiformia 4.5 mm longa tenuiter 5-costata minute sparseque pilosula apice in rostrum 4–4.5 mm longam producta. Receptaculum nudum foveolatum. (Fig. 3, *a–j.*)

Type locality: Colombia: Magdalena: Sierra de Perijá, plain between Cerro Venado and Cerro Avión, páramo 3270–3350 m alt.; leaves rather thick, dark green above, white and more or less purplish beneath; involucre more or less purplish, 8 November 1959, J. Cuatrecasas and R. Romero Castañeda 25117. Holotype, US; isotype, COL.

Remarks: Chaptalia paramensis has a similar appearance and is closely related to *C. meridensis* Blake, from the Sierra Nevada de Mérida, Venezuela. The Sierra de Perijá species has more markedly herbaceous, although thick, subcarnose leaves which have shorter petioles and ovate blades. The floral scapes are also thicker, especially near the apex, the heads are larger and include a greater number of larger flowers, the involucre is woolly-tomentose, and the ovaries and achenes are minutely pilose and long-rostrate.

Fig. 3.—*a–j*: *Chaptalia paramensis* (Cuatrecasas and Romero 25117). *a*, head, ×2.5; *b*, inner involucral bract, ×2.5; *c*, outer female flower, ×2.5; *d*, style end of outer flower, ×10; *e*, inner female flower, ×2.5; *f*, disc flower, ×2.5; *g*, anthers, ×10; *h*, style end of disc flower, ×10; *i*, achene, ×2.5 (the rostrum sectioned below the pappus); *j*, fragment of pappus bristle, ×10. *k–w*: *Chaptalia incana* (Cuatrecasas and Romero 24438). *k*, head, ×2.5; *l*, inner involucral bract, ×2.5; *m*, outer female flower, ×2.5; *n*, fragment of pappus bristle, ×10; *o*, disc flower, ×2.5; *q*, inner female flower, ×2.5; *s*, style end of female flower, ×12.5; *t*, anthers, ×5; *u*, style end of disc flower, ×10; *v*, stamen, ×10; *w*, diagrammatic young achene with its pappus, ×2.5. The pappus in the figured flowers (in *m*, *o* and *q*) is represented by only 2 bristles.

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A NEW *LYSIOSQUILLA* (CRUSTACEA: STOMATOPODA) FROM THE GULF OF CALIFORNIA, WITH A REDESCRIPTION OF *L. DECEMSPINOSA* RATHBUN

By Raymond B. Manning
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In 1910 Rathbun briefly described a small stomatopod from Peru and placed it in the genus *Lysiosquilla*. Schmitt (1940) reported the same species from Costa Rica; he felt that the species was based on immature specimens because of the shape of the telson and the size of the animals. Neither Schmitt nor Rathbun figured the species in detail.

Since the description of *L. decemspinosa*, two other similar species have been described, *L. chilensis* Dahl, 1954, from Chile, and *L. grayi* Chace, 1958, from Massachusetts, on the Atlantic coast of America. These three species form a small, compact group within the genus *Lysiosquilla*. They can be characterized by their small size, 40 mm or less at maturity, the loosely articulated body, and the shape and spination of the telson, inasmuch as the posterior margin of the telson forms a false eave over the true marginal spines. Also, these three species lack the mandibular palp, have no papillae on the antennal protopod, and have but four epipods.

Discovery of several undescribed related species in the western Atlantic led the author to re-examine the available specimens of *L. decemspinosa* in the collections of the U. S. National Museum. During examination of other species of *Lysiosquilla* for comparative purposes, the author found that the small broken male referred to *L. digueti* Coutiere by Schmitt (1940) was actually an undescribed species, allied to *L. decemspinosa*.

Contribution No. 307 from The Marine Laboratory, University of Miami, Miami 49, Florida.

In order to clarify the status of these species within the genus, and to bring attention to their existence, a redescription of Rathbun's species and a description of the new species is here presented.

In the following discussion, the number of teeth arming the raptorial dactylus always includes the terminal tooth.

I am indebted to Fenner A. Chace, Jr., Curator, Division of Marine Invertebrates, U. S. National Museum, for providing working space in the National Museum and for the loan of comparative material.

This paper constitutes a technical report to the National Science Foundation under Grant No. G-11235.

Lysiosquilla decemspinosa Rathbun, 1910

Figs. 1–3

Lysiosquilla decemspinosa Rathbun, 1910: 566, Pl. 53, Fig. 3; Kemp, 1913: 203 (listed only); Schmitt, 1940: 189, Fig. 20.

Material examined: 1♀, 23.7 mm, total length; inside beach at Capon, Peru; 30 January 1908; R. E. Coker; lectotype, USNM 40498. 1♂, 21.3 mm, total length; 2♀♀, 16.2–24.7 mm, total length; inside beach at Capon, Peru; 30 January 1908; R. E. Coker; paratypes, USNM 105352. 2♀♀, damaged; Isla San Lucas, Gulf of Nicoya, Costa Rica; 15 January 1930; M. Valerio; USNM 64138. 1♂, about 18 mm, total length; Playas Blancas, Costa Rica; 3–5 fms.; 8 February 1935; Hancock Pacific Exped., Stat. 460. USNM 81684.

Description: Eyes small, cornea globular, slightly overhanging lateral margin of stalk, not extending to end of antennular peduncle.

Antennal scale small, not as long as rostral plate, antennal protopodite lacking papillae.

Rostral plate half again broader than long; lateral margins convex and subparallel, anterior margins concave, sloping forward to an obtuse apex which is in advance of the acute anterolateral angles. Rostral plate completely covers the dorsal processes of the antennular and ophthalmic somites and the base of the eyes.

Carapace smooth, short, without carinae; gastric grooves present, cervical groove faintly indicated lateral to each gastric groove. Carapace rounded anterolaterally and posterolaterally.

Raptorial claw small; dactylus armed with 11 teeth, with a prominent notch followed by a low lobe on outer, proximal margin; propodus armed with four movable teeth on inner, proximal margin, and a row of pectinations on outer margin; dorsal ridge of carpus undivided, obscure, ending in a blunt prominence.

Width of propodus of fourth thoracic appendage half again as great as length; width of propodus of fifth thoracic appendage equal to length, the width of the propodus of the fifth thoracic appendage half that of

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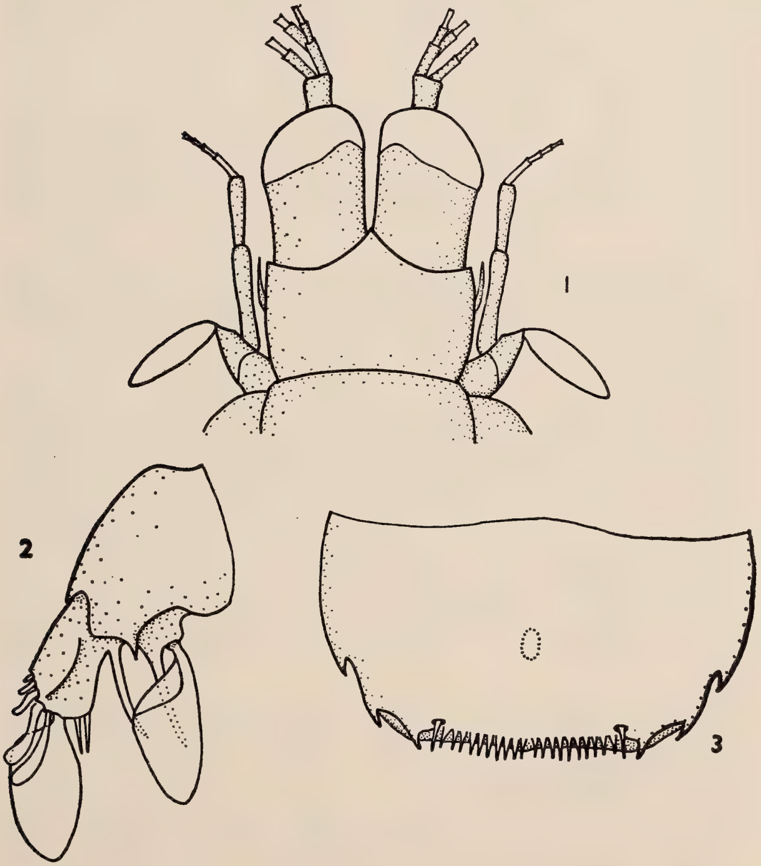
the fourth. Mandibular palp absent. Epipods present on first 4 thoracic appendages only.

Exposed thoracic somites truncate laterally, corners rounded. Inner branch of walking legs almost circular on appendages of sixth and seventh thoracic somites, ovate on the eighth somite. Copulatory tubes well-developed in the males.

Abdomen smooth, flattened, loosely articulated, not increasing in width distally.

Telson almost half again wider than long, smooth dorsally and convex in all directions; posterior false eave with a slight rounded, median



Figs. 1–3. *Lysiosquilla decemspinosa* Rathbun: Fig. 1.—Anterior portion of body of lectotype, ×18. Fig. 2.—Left uropod of lectotype, ×18. Fig. 3.—Ventral view of telson of female from Isla San Lucas, Costa Rica, ×22.

projection, and a concave emargination on either side; tips of submarginal teeth visible dorsally. Posterior armature, on each side, consisting of a transverse row of 9–11 small, fixed submedian spines; a large, movable submedian tooth, outside of these and slightly in front of them, and 3 marginal spines. In one specimen (USNM 81684, ♂) there are two additional denticles, one between each of the lateral spines.

Basal segment of uropod with a small spine on anterior half of ventral surface; five movable, graded, spatulate spines on outer margin of penultimate segment, the last extending to the midpoint of the ultimate segment; penultimate segment also armed with two or three slender fixed spines on inner distal margin; inner branch of uropod spatulate, with anterior portion of inner margin folded over. Inner spine of basal prolongation much the longer.

Color: Almost completely faded, but with a few dark chromatophores scattered on the exposed surfaces.

Measurements: ♀ Lectotype. Total length, 23.7 mm; carapace length, 3.2 mm; rostral plate length, 1.0 mm; telson length, 1.9 mm; telson width, 2.9 mm. ♂ Paratype. Total length, ca. 22.5 mm; carapace length, 3.2 mm; rostral plate length, 1.1 mm; telson length, 1.8 mm, telson width, 2.9 mm.

L. decemspinosa can immediately be separated from *L. chilensis* and *L. grayi* by the angled anterolateral angles of the rostral plate, the smaller number of teeth on the raptorial dactylus, and the smaller number of denticles in the submedian row of the telson.

L. perpasta Hale from Australia somewhat resembles these species, but differs in the configuration and spination of the telson. The body is more compactly put together, the carapace is comparatively longer, and the rostral plate is longer than wide. Although *L. perpasta* lacks the mandibular palp, it has a full complement of epipods and has definite papillae on the antennal protopod. It possibly represents the Indo-Pacific parallel to the American group of species allied to *L. decemspinosa.*

Remarks: There is little doubt that the small specimens referred to this species are mature, as the males have the copulatory tubes well-developed. The size of the species is somewhat smaller than *L. grayi* Chace.

Discussion: There is some variation in the amount of swelling of the telson. In several of the paratypes the posterior margin is almost circular, not emarginate, as figured.

The rostral plate of the Isla San Lucas specimen has the anterolateral corners of the rostral plate less produced than in the type material.

Habitat: The type series was collected from vertical holes in the muddy sand of the inside beach at Capon; small yellow eggs were noted attached to the sides of the holes.

The Hancock specimen was taken in the middle of the bay at Playas Blancas in mud, sand, and algae at three to five fathoms.

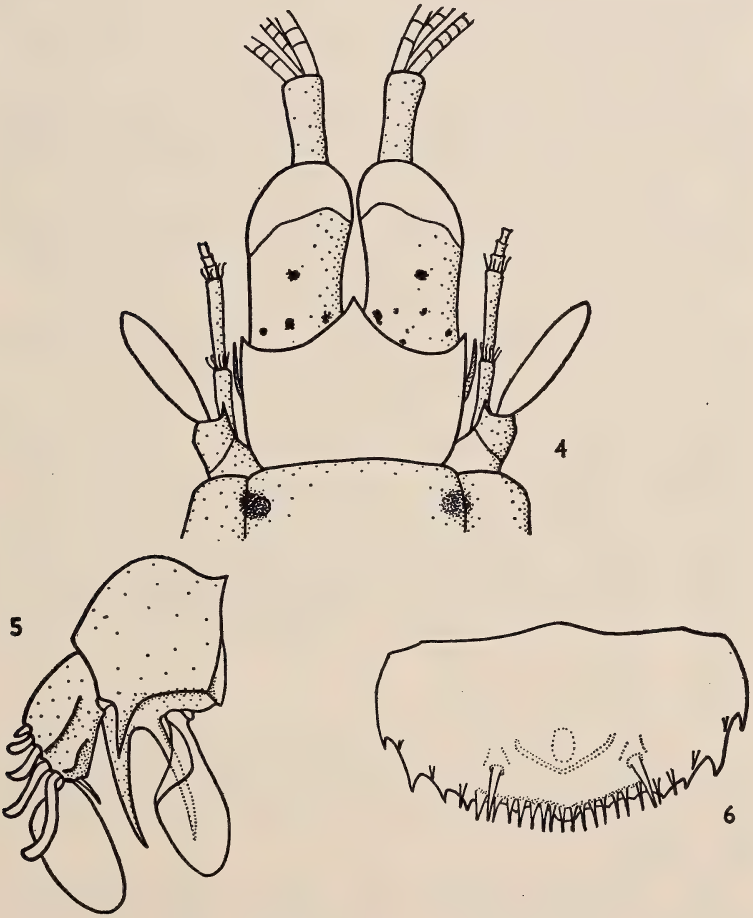
Lysiosquilla californiensis, new species

Figs. 4–6

Lysiosquilla digueti Schmitt, 1940: 194 (reference to the male specimen only, Hancock Exped. Stat. 595-36).

Material examined: 1 damaged ♂, ca. 20 mm; total length; Puerto Escondido, west side of Gulf of California; 26 fms.; Hancock Exped. Stat. 595-36. Holotype USNM 76375.

Description: Eyes small, cornea subglobular, set obliquely on stalk.



Figs. 4–6. *Lysiosquilla californiensis,* new species: Fig. 4.—Anterior portion of body of holotype, ×20. Fig. 5.—Left uropod of holotype, ×20. Fig. 6.—Ventral view of telson of holotype, ×20.

Eyes extend over the articulation of the second and third segments of the antennular peduncle.

Antennules short; bases of dorsal processes of antennular somite covered by rostral plate, although the spinous terminations of these processes are visible lateral to the rostral plate.

Rostral plate much wider than long, with anterolateral angles sharp, acute; anterior margins concave, acute apex in advance of anterolateral angles.

Carapace smooth, short, without carinae; gastric grooves distinct, cervical grooves much reduced, visible lateral to each gastric groove. Posterolateral angles broadly rounded.

Antennal scale small, not as long as rostral plate; papillae not present on antennal protopod.

Raptorial claw small; dactylus armed with eight teeth on inner margin, outer margin with a deep notch at base followed by a broad lobe. Propodus with four movable teeth, second much the smallest, on inner proximal margin, and a row of pectinations on upper margin. Dorsal ridge of carpus ending in a strong tooth.

Propodus of fourth thoracic appendage about twice as broad as that of the third and almost three times as broad as that of the fifth. Epipods present on first four thoracic appendages. Mandibular palp absent.

Thoracic somites truncate laterally. Inner branch of walking legs two-segmented, almost circular on the sixth and seventh legs, more ovate on that of the eighth.

Abdomen smooth dorsally, without trace of carinae, spined only at the posterolateral corners of the sixth somite.

Telson twice as wide as long, unarmed dorsally. Posterior margin emarginate, forming a false eave overhanging the true posterior spines. There are thirteen projections on the false eave, a large median one, rounded distally, and six, smaller acute ones on either side. The posterior armature, on either side, under the false eave, consists of a row of eight sharp submedian denticles, a large, movable submedian tooth, mesiad and anterior to the outermost denticle, and three more immovable spines laterally. There is a raised ridge on the ventral surface posterior to and half way around the anal pore.

Basal segment of uropods with a sharp spine on the ventral surface. The two spines of the basal prolongation are subequal in length. Penultimate segment of outer branch with five, graded, movable, spatulate spines on its outer margin, the last extending to the midpoint of the ultimate segment, and one or two slender, movable spines on the inner, distal margin.

Color: The pigment is largely faded. There are several dark chromatophores on the dorsal surface of the eyestalks. Carapace with three pairs of large spots, one anteriorly, on and inside the gastric grooves, a second pair posterior to these on the lateral plates, and a third pair in the region of the cervical groove. Thoracic somites and abdomen with paired pigment spots on each somite, with a larger spot at the posterolateral angle of the fifth abdominal somite.

Measurements: Holotype. Total length, ca. 20 mm; carapace length, 2.8 mm; rostral plate length, 1.1 mm; telson length, 1.2 mm; telson width, 2.4 mm.

Discussion: L. californiensis is very closely related to *L. decemspinosa* and its allies. It can be distinguished from them by the almost spinous anterolateral angles of the rostral plate and the large number of projections of the false eave of the telson.

The absence of dorsal spines on the telson distinguishes these species from *L. digueti* and its Atlantic counterpart, *L. biminiensis* Bigelow.

Schmitt was misled by the configuration of the telson and size of this specimen. He felt that it was the "first littoral stage" of *L. digueti* although it is only about three mm shorter than the female of that species taken by the Hancock Expedition. He pointed out the differences between the two specimens, but attributed them to age.

Remarks: Although the specimen is broken in half, its diagnostic features are easily discernible. The second tooth on the left side of the posterior margin of the telson is more triangular and not as sharp as the remainder of the teeth.

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REPTILES (EXCLUSIVE OF SNAKES) OF THE CHILPANCINGO REGION, MEXICO

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In the course of biological investigations carried on in central Guerrero from 1952 to 1958, the senior author and his associates collected 1011 lizards representing 44 species and 15 turtles of one species. These specimens are deposited in the Texas Cooperative Wildlife Collections (TCWC) and constitute the basis for this report. Since collecting was not selective (except for *Ctenosaurus*), the number of specimens taken is a crude measure of the relative abundance of each species during the period of the survey. In presenting our report we have given special attention to data on reproduction and on the habitat occupied by each species.

In a report on the snakes of the Chilpancingo Region, Davis and Dixon (1959) describe the physiography and vegetation of the region here under consideration. Briefly, the area is that lying between latitudes 17° N and 18° N and longitudes 99° W and 100° W. Chilpancingo lies approximately in the center of this quadrangle.

The following lizards were not collected by us although they have been reported in the literature from the Chilpancingo Region: *Hemidactylus frenatus,* Tierra Colorada (Smith and Taylor, 1950); *Anolis nebuloides,* ca. Tierra Colorada, 2 mi N Xaltianguis (Smith, 1933); *Sceloporus horridus oligoporus,* ca. Xaltianguis (Smith, 1939b); *Sceloporus asper,* Chilapa (Ahl, 1934). Smith and Taylor (1950) question the identification of the last-named species.

Family BIPEDIDAE Stejneger

Bipes canaliculatus Bonnaterre

TCWC (1), Arid Tropical Scrub. Mexcala, 1600 ft. Other records: Balsas, Tecuaiziapan (Smith and Taylor, 1950). Our specimen was found in a trash pile after a rain. S–V length, 207 mm; tail, 36 mm; ventral body annuli, 166; caudal annuli, 33; dorsal annuli, 252; preanal pores, 6. These measurements and scale counts appear to be near the maximum for the species. Smith's (1949) largest specimen, of 12 reported on, had the following measurements and counts: S–V length, 192 mm; tail, 30 mm; ventral body annuli, 164; caudal annuli, 35+; dorsal annuli, 201. The fifth finger in our specimen is minute and lacks a claw.

Family GEKKONIDAE Stejneger

Coleonyx elegans nemoralis Klauber

TCWC (2), Arid Tropical Scrub and Tropical Deciduous forest. Acahuizotla, 2800 ft (1♀); 1 mi SW Colotlipa, 2700 ft (1♀). Other record: Agua del Obispo (Klauber, 1945). In both of our specimens the prenasals are distinctly separated. The one from Colotlipa, taken 2 July, was found after heavy rains under a rock in a rather dry chaparral zone which appears to be a finger of the Balsas Basin. The specimen from Acahuizotla, taken 11 June, is from a broadleaf forest association. Each female contained two large eggs nearly ready for deposition. Snout–vent length, 83 mm and 91 mm, respectively.

Phyllodactylus bordai Taylor

TCWC (1), Arid Tropical Scrub. Mexcala, 1600 ft. This specimen, a juvenile captured near Mexcala on 26 June, is 40 mm in snout–vent length. The identification is tentative until a larger series becomes available. It was found in a rocky situation where large boulders and crevices offered concealment.

Phyllodactylus delcampi Mosauer

TCWC (1♀), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 900 ft. Other record: Tierra Colorada (Mosauer, 1936). This gecko, one of the largest *Phyllodactylus* in Mexico, attains a snout–vent length of 90 mm. Our specimen has 21 rows of scales between the orbits, 22 across snout between third labials; transverse row of 6 scales bordering postmentals; no enlarged tubercles on tail, but 16 rows of low, moderately keeled tubercles on the dorsum, four more rows than the maximum given by Smith and Taylor (1950). Mosauer (1936), however, reported 13 rows in one of the two specimens on which the original description of *delcampi* was based. The purplish brown dorsal coloration, with irregular dark brown cross bands, agrees with the type description. This specimen, captured 2 July, was not gravid. Snout–vent length, 75 mm.

Phyllodactylus lanei Smith

TCWC (54), Tropical Deciduous and Pine-oak forests. Acahuizotla,

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2800 ft (9♂♂, 16♀♀, 1 juv.); 1 mi SW Tierra Colorada, 900 ft (3♂♂, 4♀♀); 5 mi SW Tierra Colorada, 1000 ft (1♂, 7♀♀, 1 juv.); Agua del Obispo, 3300 ft (4♂♂, 5♀♀, 2 juv.); Rincón, 2600 ft (1♂). Other records: 2 mi S Garrapatas; between Rincón and Cajones; Tierra Colorada (Smith, 1935b). The number of scales between the orbits in the series studied ranged from 14 to 18, with more than 80 per cent of the specimens having 15, 16, or 17. In this series the three or four subdigital lamellae preceding the penultimate are tripartite. Snout–vent length in sexually mature males varied from 60 mm to 75 mm (mean, 68 mm); in females, from 55 mm to 72 mm (mean about 62 mm). Females taken in June contained enlarged ovarian follicles; four juveniles, 28 mm, 35 mm, 40 mm, and 41 mm in snout–vent length were captured. Males can readily be distinguished by the presence of a large, conspicuous postanal scale.

These geckos were found mainly at night on boulders along hillsides and streams; many were found in caves near Acahuizotla.

Phyllodactylus magnus Taylor

TCWC (31), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (9♂♂); Agua del Obispo, 3300 ft (6♂♂, 6♀♀); 1 mi SW Colotlipa, 2700 ft (4♂♂, 4♀♀); Rincón, 2600 ft (1♂, 1 yg.). Other records: El Ocotito; Garrapatas; Tierra Colorada (Taylor, 1942). In a series of three females and eight males, the number of scales across the interorbital region ranges from 19 to 29, a somewhat greater range (23–29) than reported by Taylor (1942). However, in those specimens with 19 and 21 interorbital scales the subdigital lamellae, except for the outer one, are undivided and the abdomen was yellow in life. The largest female in our series is 80 mm in snout–vent length; the largest male, 93 mm. We can find no suitable means of distinguishing males from females by external characters.

Males taken from mid-June to early July had enlarged testes; females contained enlarged ovarian follicles and enlarged fallopian tubes. A juvenile 37 mm in snout–vent length was captured at Rincón on 26 June. Most of our specimens were found in caves; one was found on the trunk of a fig tree, others on boulders.

In the Pine-oak forest above Agua del Obispo, *P. magnus* and *P. lanei* have been captured together on the same boulder.

Family IGUANIDAE Gray

Anolis dunni Smith

TCWC (37), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800–3000 ft (10♂♂, 10♀♀); Agua del Obispo, 3300 ft (8♂♂, 11♀♀); 1 mi SW Colotlipa, 2800 ft (3♂♂, 3♀♀). Other record: Agua del Obispo (Smith, 1933). Gular fan ruby red; hind leg to eye in males (shorter in females); ventrals smooth; white stripe under eye; moderately large size. Our specimens were found on boulders and tree trunks, especially in riparian situations. Females taken in early June had ova about

4 mm in diameter; those taken in late June and early July had large eggs, 7 × 10 mm, some with shells and nearly ready for deposition.

Anolis gadovi Boulenger

TCWC (7), Tropical Deciduous forest. 1 mi S Tierra Colorada, 900 ft (6♂♂, 1♀). Other record: Tierra Colorada (Boulenger, 1905). Gular fan ruby red; hind foot to eye or beyond; ventrals smooth; four gulars in contact with mental. Our specimens were found mainly on large boulders. A female taken 2 July, had two eggs with well-developed shells, 7 × 15 mm, in the oviducts.

Anolis liogaster Boulenger

TCWC (3♀♀), Cloud forest. 2 mi W Omiltemi, 7900–8100 ft. Other record: Omiltemi (Boulenger, 1905; Gadow, 1905). Upper parts coppery brown with scalloped, light paravertebral stripes; one female with broad, straight-edged, cream-colored stripe as is found occasionally in females of *A. dunni* and *A. nebulosus.* Ventrals smooth; hind toe to eye (or nearly so); gular fan reddish. The three females collected 7–11 June 1953, were gravid, each with two large eggs; the largest measured 7 × 13 mm. The three specimens were found on fallen pine logs on a ridge northwest of Omiltemi. Five specimens in the U. S. National Museum have been preserved so long (1903) that the scalloped paravertebral stripes are obscure, but they are still discernible in some specimens.

Anolis megapholidotus Smith

TCWC (33), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800–3500 ft (6♂♂, 5♀♀); near Agua del Obispo, 3300–4000 ft (6♂♂, 13♀♀); SW of Colotlipa, 5000 ft (1♂, 2♀♀). Other record: Between Rincón and Cajones (= Agua del Obispo) (Smith, 1933). Gular fan red; dorsals as large or larger than keeled ventrals. Most of our specimens were found on tree trunks in coniferous forests. Females taken in June were gravid—8 June, ova about 2 mm in diameter; on 16 June, 8 × 5 mm, but without shell; on 27 June, 10 × 6 mm with shell. The enlarged ova were almost always two in number. Testes in males taken in June were small, indicating that the breeding season had passed.

Anolis microlepidotus Davis

TCWC (5), Pine-oak and Tropical Deciduous forests. 2.5 mi S Almolonga, 5600 ft (3♂♂) 4 mi W Chilpancingo, 5800 ft (1♂, 1♀). Other record: Chilpancingo (Davis, 1954). A small anole with ruby red gular fan; ventrals keeled and much larger than dorsals; hind toe fails to reach ear with hind leg laid forward. This species seems to be restricted to the chaparral-oak belt at middle elevations near Chilpancingo. One specimen from near Almolonga was captured in a swampy situation, but all the others came from xeric sites.

Anolis nebulosus Wiegmann

TCWC (48), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (16♂♂, 6♀♀); Agua del Obispo, 3300 ft (6♂♂, 3♀♀); 1 mi SW Colotlipa, 2700 ft (6♂♂, 10♀♀); 2 mi S Palo Blanco, 3500 ft (1♂). A moderate sized anole; gular fan yellow with bluish spot in anterior "corner"; dorsals enlarged, but much smaller than keeled ventrals; ear opening very small; hind toe to ear or nearly so. Females taken in June and early July were gravid with one to three (usually two) enlarged ova; the largest measured 10 × 6 mm. This lizard is normally found on rocks or on trunks of broad-leaved trees, usually below the pine belt. It is most common in riparian situations.

Anolis omiltemanus Davis

TCWC (8), Pine-oak and Cloud forests. 2 mi W Omiltemi, 7800 ft (3♂♂, 2♀♀); 4 mi W Mazatlán, 7800 ft (1♂, 2♀♀). A small anole with yellowish-orange gular fan; two to four postrostrals; ventrals smooth, larger than dorsals; hind toe to ear or less; loreals usually in three or four rows, rarely in five. Two females taken 11 June and two taken 24 June were gravid, each with two enlarged ova.

Anolis subocularis Davis

TCWC (3), Tropical Deciduous forest. 1 mi S Tierra Colorada, 1000 ft (2♂♂); 30 km N Acapulco (1♂). Other records: 2 mi S Garrapatas; Rincón; Tierra Colorada (Davis, 1954). Medium-sized anole, ventral scales keeled; supralabials and suboculars separated by posterior extension of lowest row of loreals, or nearly so; hind toe to eye. Seemingly the most common anole below an elevation of 1500 ft on the Pacific slope of Guerrero.

Basiliscus vittatus Wiegmann

TCWC (49), Tropical Deciduous forest. Acahuizotla, 2800 ft (21♂♂, 8♀♀); 1 mi SW Colotlipa, 2800 ft (6♂♂, 2♀♀); 5 km SW Tierra Colorada, 1000 ft (2♂♂, 7♀♀); 1 mi SW Tierra Colorada, 1000 ft (3♀♀). Other records: Tierra Colorada (Gadow, 1905), 1 mi N Organos (Smith, 1935b).

Our specimens were all found near permanent water, particularly in areas strewn with large boulders. Adult females captured in the last half of June contained large eggs (12 mm × 20 mm) nearly ready for deposition. The larger females (snout–vent length 120 mm or more) usually contained six to eight eggs; the smaller, sexually mature ones, four or five. Those females less than 70 mm in snout–vent length were sexually immature. Recently hatched juveniles (34 to 40 mm in snout–vent length) were captured 5 June, 22 June, and 2 July. Old females taken after 2 July were sexually inactive. These data suggest a breeding season extending from April to July.

The dorsal fin, characteristic of males, is not evident in individuals less than 80 mm in snout–vent length. In males 90–110 mm in snout–vent length, the fin is about 2 mm high; and in fully adult males, snout–vent length 138 or more, it is 8 to 10 mm high. The occipital fan exhibits a similar pattern of development with age. In newly hatched males it is not evident; in those 75 mm in snout–vent length the fan is 12 mm in length; in subadults, 28 to 30 mm in length; and in old males, 40 to 50 mm (Fig. 1). Females develop neither a dorsal fin nor an occipital fan.

In this species the ratio of length of tail to snout–vent length is nearly constant from infancy to old age (Fig. 2).

Ctenosaura pectinata Wiegmann

TCWC (11), Arid Tropical Scrub, Dry and Humid Tropical Deciduous forest, and Lower Pine-oak forest. Acahuizotla, 2800 ft (1 ad. ♂, 3 ad. ♀♀, 2 yg.); Agua del Obispo 3500 ft (1 juv.); 10 mi SE Colotlipa,

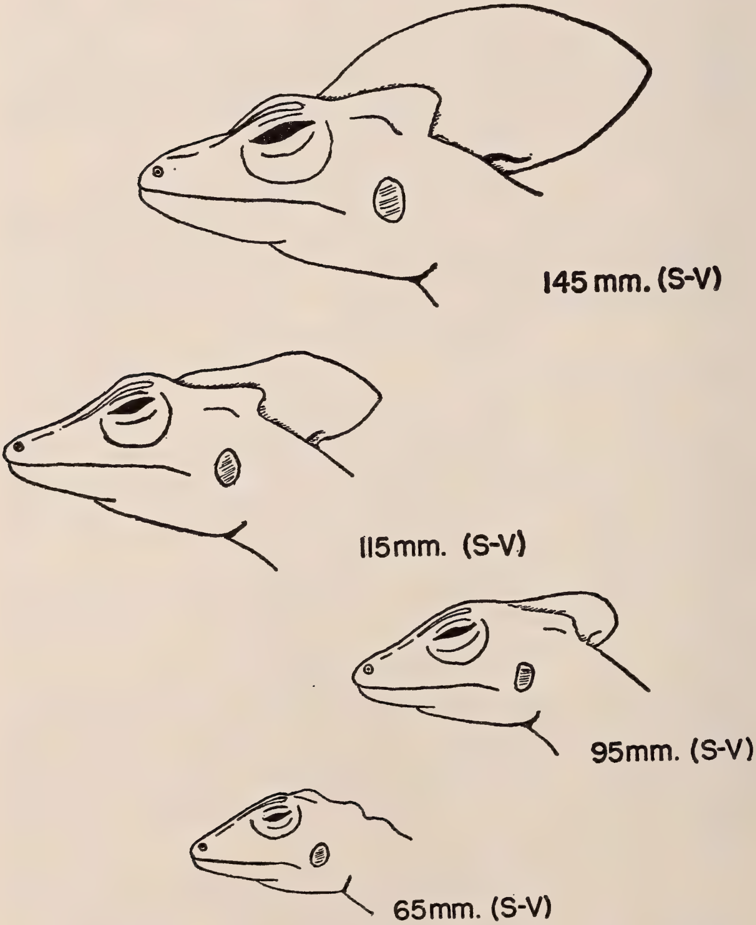


Fig. 1. Ontogenetic changes in the occipital fan of male *Basiliscus vittatus.*

4000 ft (1 yg.); 5 mi S Puenta de Mexcala, 1800 ft (1 subad. ♀, 1 yg.); 5 mi SW Tierra Colorada, 1000 ft (1 yg. ♂). Other records: Balsas, (Smith, 1939a) Cocoyul, Río Balsas (Gadow, 1905); near Mexcala, 1 mi N Organos, Tierra Colorada, 16 mi S Tierra Colorada (Smith, 1935b).

This is a widespread lizard in Guerrero at elevations below 6000 ft. It prefers rocky situations, particularly canyon walls and bluffs. In many localities it is regularly hunted by local residents for food.

Sexually mature adults measure 200 mm or more in snout–vent length. Gonads of animals smaller than that appear to be immature. Breeding probably takes place in early spring. None of the adults examined in June was sexually active, but small (snout–vent length 59–65 mm), green-colored juveniles were abundant then. Most of them were probably not more than a month old.

Phrynosoma asio Cope

TCWC (12), Arid Tropical Scrub. Near Mexcala 1600 ft (8♂♂, 1♀); Puente de Mexcala 1650 ft (2♂♂); 5 mi S Puente de Mexcala, 1800 ft (1 yg. ♀). Other record: Río Balsas (Gadow, 1905).

Three of our 12 specimens were found at the side of the highway or dead on the pavement south of the Río Balsas; most of the others were found during the heat of mid-day under bits of bark beside an old match factory on the south bank of the Río Balsas. A male and female were found copulating on 26 June. Both animals were taken alive and kept in captivity. On 13 August, the female laid four eggs, but died, probably from malnutrition, in the process. Autopsy revealed 17 additional eggs ready for deposition.

Phrynosoma taurus Dugès

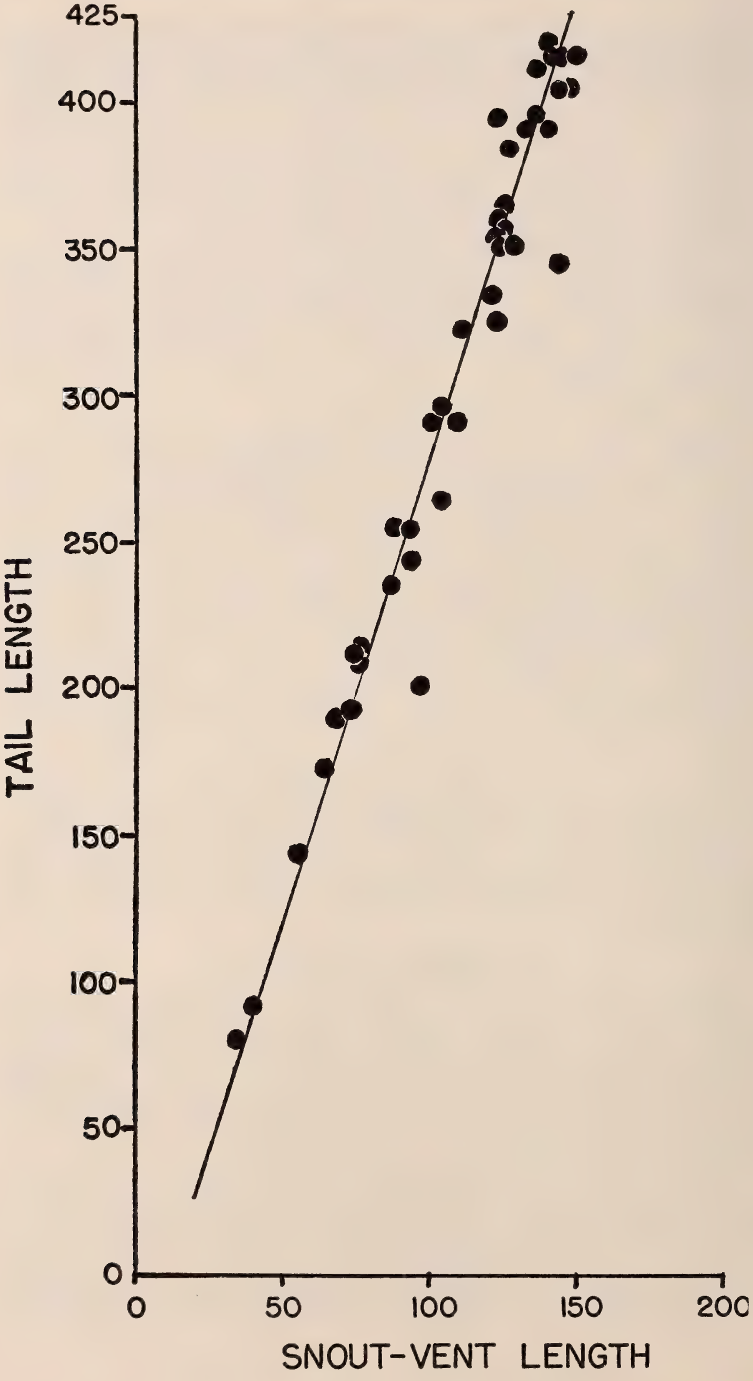
TCWC (1♀), Chaparral-oak forest. 3 mi W Chilpancingo, 5000 ft. Other records: Amula; 5 mi N Chilpancingo (Smith & Taylor, 1950).

Our specimen, taken 17 June, is a young, sexually inactive female 52 mm in snout–vent length. It was found on a dry, rocky, brush-covered hill. Seemingly the species is rare and restricted in its distribution in Guerrero.

Sceloporus formosus scitulus Smith

TCWC (97), Chaparral-oak, Pine-oak and Cloud forests. 15 km SW Chilpancingo, 9000 ft (1♂); 4–5 mi W Mazatlán, 7800–8200 ft (25♂♂, 14♀♀, 2 juv.); 2 mi SW Omiltemi, 7900 ft (12♂♂, 14♀♀); Tejocote (= Tejocotal) 7000 ft (5♂♂, 3♀♀); 2.5 mi S Almolonga, 5600–5800 ft (10♂♂, 9♀♀, 2 juv.). Other records: Chilpancingo (Gadow, 1905), Omiltemi (Smith, 1942).

We found individuals of this species most commonly on stumps, logs, and fallen trees in the pine-oak forest west of Chilpancingo, but east of there, at Almolonga, they occurred in the oak belt. All females 56 mm in snout–vent length and larger were gravid in mid-June. Small females, probably in their first breeding season, contained three or four enlarged ova; fully adult females usually contained eight or nine. Males seem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to reach sexual maturity at an earlier age than females. Young males no longer than 40 mm in snout–vent length had enlarged testes, yet they had not developed the color pattern of adult males. Snout–vent length of the largest male was 83 mm; of the largest female, 77 mm.

Sceloporus stejnegeri Smith

TCWC (4), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 900 ft (1♂, 3♀♀). Other record: Tierra Colorada (Smith, 1942).

A member of the *formosus* group, with complete, or nearly complete, black nuchal collar, not light bordered; bluish green color above. None of our specimens, captured 2 July, was sexually active. The largest specimen, an adult female, measured 83 mm in snout–vent length.

Sceloporus melanorhinus calligaster Smith

TCWC (5), Tropical Deciduous forest. Acahuizotla, 2800 ft (3♀♀); 1 mi SW Colotlipa, 2700 ft (1♀); 4 mi W Ocotito, 2600 ft (1♂). Other records: Tierra Colorada (Gadow, 1905); Garrapatas, Mexcala (Smith, 1939b).

Our specimens were all found in trees. All of the adult females taken in June contained from five to eight enlarged ova; those nearly ready for deposition (6 June) measured 11 × 18 mm. Snout–vent length of females, 87–96 mm; tail, 116–127 mm; of one male, 80 mm and 113 mm, respectively. One specimen from 8 km N Taxco (5500 ft), northeast of the Chilpancingo area, seems to represent an altitudinal record; most specimens have been captured at elevations below 3500 feet.

Sceloporus horridus horridus Wiegmann

TCWC (82), Arid Tropical Scrub, Chaparral-oak, Pine-oak and Tropical Deciduous forests. Acahuizotla, 2800 ft (14♂♂, 19♀♀); Agua del Obispo, 3300 ft (1♂); Almolonga (= Amula) 5600 ft (6♂♂, 9♀♀); 16 km S Chilpancingo, 4300 ft (1♀), 4 mi W Chilpancingo 5800 ft (5♂♂, 6♀♀); 14 mi W Chilpancingo, 6500 ft (1♂); 1 mi SW Colotlipa, 2700 ft (8♂♂, 4♀♀); Mexcala, 1600 ft (1♂, 2♀♀); 5 mi S Puente de Mexcala, 1800 ft (2♂♂); 1 mi S Tierra Colorada, 900 ft (1♂, 1♀); 2 mi N Tixtla, 4400 ft (1♀). Other records: between Cajones and Acahuizotla; Chilpancingo; 16 km N Mexcala; Palo Blanco; Tierra Colorada (Smith, 1939b); Chilapa (Ahl, 1934).

This species seems to be the most common lizard in Guerrero at elevations between 1000 feet and 6000 feet, especially in rocky areas.

Breeding probably takes place from May to September. Most of the sexually mature females (70 mm or more in snout–vent length) taken in Guerrero contained large ova in June and early July. Davis and Smith (1953: 103) found the same condition existing in females from the state of Morelos in late July and August. The larger (85–100 mm snout–vent

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Fig. 2. Correlation of snout–vent length and tail length in *Basiliscus vittatus*.

length), hence probably the older, females contained an average of 12 (9–15) large eggs, whereas smaller females (70–82 mm), probably in their first breeding season, contained an average of 9 (5–13). This difference is probably a function of body size of the female because we could detect no appreciable difference in size (8 × 15 mm) of eggs nearly ready for deposition. There is evidence that two or more broods are produced annually. Several adult females taken early in June and another lot taken the first week in July contained numerous ovarian eggs 3 mm to 4 mm in diameter and at the same time had large, flabby oviducts. This condition suggests that these females had already laid one clutch of eggs and that another was in process of developing.

Sexually mature males (testes 5–10 mm in diameter) ranged from 67 mm to 115 mm in snout–vent length. Two males 65 mm in snout–vent length had small (1 mm) testes and three females 60 to 65 mm in snout–vent length had infantile ovaries. These five animals were probably from late broods of the previous year. No specimens smaller than 60 mm were found in June and July. Davis and Smith (*op. cit.*), reported finding newly hatched young early in August in the adjacent state of Morelos.

Sceloporus grammicus grammicus Wiegmann

TCWC (18), Pine-oak and Cloud forests. 4–5 mi W Mazatlán, 7800–8500 ft (2♂♂, 1 juv.); 2 mi W Omiltemi, 7900 ft (3♂♂, 4♀♀); 2.5 mi S Almolonga, 5600 ft (3♂♂, 1♀, 4 juv.). Other records: Chilpancingo, Omiltemi (Smith and Taylor, 1950).

These lizards are mainly arboreal and live on trees in the mixed forest. None of the three adult females taken 9 June and 2 July was gravid, but adult males had large testes. Four juveniles captured in early July range in size from 35 mm to 43 mm (snout–vent length) and appear to be young-of-the-year. If so, the breeding season must be in April and May. Sexual maturity is reached when the lizard has attained a snout–vent length of about 45 mm. The largest male measured 71 mm (snout–vent length); the largest female, 62 mm.

Sceloporus mucronatus omiltemanus Günther

TCWC (38), Chaparral-oak, Pine-oak, and Cloud forests. 4 mi W Mazatlán, 7400–7800 ft (3♂♂, 5♀♀, 2 juv.); 5 mi W Mazatlán, 8000–8500 ft (1♂, 1♀, 4 juv.); Omiltemi, 7900 ft (5♂♂, 9♀♀, 2 juv.); Tecojote, 7000 ft (3♂♂, 1 juv.); 2.5 mi S Almolonga, 5800 ft (1♀, 1 juv.). Other record: Sierra de Burro ca. Omiltemi (Smith, 1939b).

West of Chilpancingo, this species is an inhabitant of the pine-oak community at high elevations, but east of there in the vicinity of Almolonga, it occurs on the oak-covered ridges. Individuals have a decided preference for logs and stumps, or snags with cavities or crevices in them, in openings in the forest where they can sun themselves.

Breeding must take place in March or April because by the first week in June young-of-the-year (34–36 mm in snout–vent length) were abundant. All sexually mature females we collected in June had quiescent ovaries, but large, convoluted oviducts. Some of the males still had enlarged testes (8 mm in diameter), but in most of them the size was only 4 mm or 5 mm. These data suggest a single brood yearly.

Sceloporus siniferus siniferus Cope

TCWC (94), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (8♂♂, 16♀♀); 2 mi W Acahuizotla, 3500 ft (10♂♂, 8♀♀); Agua del Obispo, 3300 ft (8♂♂, 10♀♀); mountains W of Agua del Obispo, 4000 ft (4♂♂, 5♀♀); 10 mi SE Colotlipa, 4000 ft (1♂, 2♀♀); 1 mi SW Colotlipa, 2700 ft (9♂♂, 8♀♀); 5 mi W Mazatlán, 8000 ft (2♀♀); Tierra Colorada, 1000 ft (2♂♂); 5 mi SW Tierra Colorada, 1000 ft (1♂). Other records: 2–3 km S Acahuizotla; 2 mi S Garrapatas; 1 mi N Organos; between Rincón and Cajones; Xaltianguis (Smith, 1939b). Buena Vista, Rincón (Gadow, 1905); Omiltemi (Günther, 1890). Río Balsas (Smith, 1939b) is probably in error.

This species appears to be widespread throughout Guerrero south of the Río Balsas. Our specimens were found mainly on the trunks of trees.

Because all females taken in June and early July were gravid, with eggs ranging up to 11 × 6 mm in size, and no young-of-the-year were seen by us, we assume that courtship and breeding begin in May. There is evidence that at least some females produce two clutches of eggs in rapid succession. The number of large eggs contained per female ranged from 2 to 9, averaging 6. Sexual maturity seems to be attained in one year.

Snout–vent length of 53 females taken in June and July ranged from 44 to 60 mm, averaging 53 mm; of 50 males, from 46 to 60 mm, averaging 55 mm. These data indicate no sexual difference in size in this species.

Sceloporus ochoterenai Smith

TCWC (44), Arid Tropical Scrub, Chaparral-oak, and Tropical Deciduous forests. 2.5 mi S Almolonga, 5600 ft (9♂♂, 9♀♀); 4 mi W Chilpancingo, 5800 ft (9♂♂, 12♀♀); 1 mi SW Colotlipa, 2700 ft (2♂♂, 2♀♀); Mexcala, 1600 ft (1♀). Other records: Balsas, between Cajones and Acahuizotla, Chilpancingo, 16 km S Chilpancingo, 2 mi N Mazatlán, 16 km N Mexcala (Smith, 1939b); Tierra Colorada (Gadow, 1905).

Our specimens were all found on the ground in relatively dry situations. Seemingly the species is a good indicator of the xeric Balsas Basin Biotic Province. The record from Tierra Colorada is open to question until additional specimens from that locality are available.

All females taken by us in June were gravid; some with ova no more than 2 mm in diameter, others with eggs measuring as much as 10 × 6 mm and nearly ready for deposition. The average number of eggs per female was slightly less than six. Adult females ranged from 43 mm to 50 mm (average about 46) in snout–vent length; males from 46 mm to 56 mm (average about 50). Since there appears to be only one age-class (adult) in our series of 62 specimens, it seems reasonable to assume that adult size and sexual maturity are attained in the first year. The only record we have for newly hatched young is for 12 August (see Davis and Smith, 1953).

Sceloporus gadoviae Boulenger

TCWC (10), Arid Tropical Scrub, and Chaparral-oak forest. Mexcala, 1600 ft (4♀♀); 5 mi S Puente de Mexcala, 1800 ft (4♂♂, 2♀♀). Other record: Near Río Balsas (Smith, 1939b).

Our specimens were found on the vertical faces of rocky out-croppings and cuts along the highway. Most of the adult females taken in June contained 3 or 4 large ova; those nearly ready for deposition measured 14 × 8 mm. Adult males measured 60–65 mm in snout–vent length; females, 52–57 mm.

Sceloporus pyrocephalus Cope

TCWC (2♂♂), Arid Tropical Scrub. 5 mi S Puente de Mexcala, 1800 ft (1); Mexcala, 1600 ft (1). Other record: Near Balsas (Smith, 1939b).

These lizards occur in open rocky areas, especially among large boulders and on limestone bluffs. They are exceedingly wary, the males more so than the females, and it is difficult for the collector to get within effective range of shot shells used in a .22 calibre pistol. When disturbed, they quickly seek refuge under the boulders or in cracks and crevices in the bluffs.

One of the females collected near Acapulco in mid-June (11 to 16 June) contained five large eggs (7 × 11 mm). All the others had flacid oviducts, but the ova were small, measuring from 2 mm to 4 mm in diameter. We judged from this condition that most of the females had oviposited by mid-June. Since Smith (1939b) reported the capture of females with 5 to 7 eggs on 5 and 21 July, it seems likely that this lizard lays two (or more) clutches of eggs during the summer.

Males and females are markedly different in size and color. Only the females have the reddish-brown head. Females range from 53 mm to 58 mm in snout–vent length; males, from 60 mm to 70 mm, and they are much more robust.

Sceloporus spinosus caeruleopunctatus Smith

TCWC (1♂), Chaparral-oak forest. 2 mi S Almolonga, 5600 ft.

This specimen, a juvenile 60 mm in snout–vent length, is referred to *caeruleopunctatus* on the basis of five supraoculars and 31 dorsal scales. It is like S. *s. spinosus* in the presence of only eight femoral pores on each side. This appears to be a new record for Guerrero and a marked extension of the known range of *caeruleopunctatus.*

Urosaurus bicarinatus bicarinatus Duméril

TCWC (3), Chaparral-oak forest and Arid Tropical Scrub. 5 mi S Puente de Mexcala, 1800 ft (1♀); 2.5 mi S Almolonga, 5800 ft (1♂, 1♀). Other records: 12 mi S Chilpancingo; Mexcala (Smith, 1935a);

Chilpancingo, Río Balsas, Tierra Colorada (Gadow, 1905); Agua del Obispo (Smith and Taylor, 1950).

This lizard seems to inhabit the open sparse vegetation in the Chilpancingo region. Our three specimens were taken from logs and trees. Both sexes are very dark on the ventral surfaces, more so than in typical *bicarinatus*. The belly patch of the male extends to the posterior third of the venter. None of them shows tendencies toward intergradation with *U. b. anonymorphus* from Colotlipa, an airline distance of only 13 miles.

Urosaurus bicarinatus anonymorphus Mittleman

TCWC (35), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (8♂♂, 7♀♀); Agua del Obispo, 3300 ft (3♂♂, 3♀♀); mountains W of Agua del Obispo, 4000 ft (2♂♂, 1♀); 1 mi SW Colotlipa, 2700 ft (3♂♂, 4♀♀); 1 mi SW Tierra Colorada, 900 ft (2♂♂, 1♀); 5 mi SW Tierra Colorada, 1000 ft (1♂). Other record: Tierra Colorada (Mittleman, 1942).

All of our specimens of *anonymorphus* are adults. There is a general tendency for specimens from the Tropical Deciduous forest to have dark venters and the belly patches fused medially. Males taken from the Pine-oak forest are paler ventrally and have two distinct belly patches separated medially by the lighter ventral coloration.

One specimen taken 6 miles east of Acapulco is typical of *anonymorphus*. This does not agree with the distributional pattern given by Mittleman (1942) who states that all *bicarinatus* east of Tierra Colorada belong to the subspecies *anonymorphus*. There seems to be a parallel situation in the distribution of *U. b. anonymorphus* and the snake *Conophis vittatus viduus*. Both are surrounded on three sides by the nominal subspecies. There appears to be a narrow corridor through which these two reptiles range from Tehuantepec, Oaxaca, to the Chilpancingo region of Guerrero.

Family SCINCIDAE Gray

Mabuya brachypoda Taylor

TCWC (16), Tropical Deciduous and Chaparral-oak forests. Acahuizotla, 2800 ft (4♂♂, 2 yg.); 2.5 mi S Almolonga, 5600 ft (2♂♂, 1♀, 2 juv.); 4 mi W Chilpancingo, 6000 ft (1♂); 1 mi SW Colotlipa 2700 ft (1♂, 2♀♀, 1 juv.). Other record: Tierra Colorada (Gadow, 1905). We have followed the systematic arrangement of Mexican *Mabuya* set forth by Webb (1958).

This skink occupies an altitudinal range on the Pacific slopes of Guerrero from 500 feet near Acapulco to at least 6,000 feet in the mountains west of Chilpancingo. It occurs in leaf litter, under logs and boulders, and in clumps of bunch grass.

This is one of the few ovoviviparous lizards. Four adult females taken from 21 June through 2 July were either gravid with young or, in one instance, had given birth to young. The gravid females contained 2, 3 and 4 nearly full-term fetuses measuring about 28 mm in snout–vent length. On 15 June and 3 July, young, recently born skinks, measuring 32 mm in snout–vent length, were found near Acahuizotla, and a slightly larger one (35 mm) was found near Colotlipa on 30 June. These data suggest that most of the young are born in June and early July.

Little sexual dimorphism is evident in this species. Adult males range from 62 mm to 72 mm in snout–vent length; females, from 63 mm to 87 mm. Like skinks of the genus *Lygosoma,* individuals of *Mabuya* have a transparent window in the lower eyelid which readily distinguishes them from members of the genus *Eumeces.*

Lygosoma assata taylori Oliver

TCWC (13), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (1♂, 2♀♀); Agua del Obispo, 3300 ft (3♂♂, 3♀♀); mountains W of Agua del Obispo, 4000 ft (3♀♀); 1 mi SW Colotlipa, 2700 ft (1♀). Other records: Chilpancingo, Tierra Colorada (Smith and Taylor, 1950); near Mazatlán; between Rincón and Cajones (Oliver, 1937).

These small, pale brown lizards were found in leaf litter and under rotten logs in the mixed forest at elevations from 2700 feet to near 4500 feet. Most of our females, which were taken in the last two weeks of June, were gravid with 1 to 4 eggs. Those nearly ready for deposition measured about 5 × 8 mm. Seemingly, one could expect to find newly hatched young ones in late July or August. Three adult males ranged from 44 mm to 51 mm in snout–vent length; 9 females, from 45 to 53.

Eumeces ochoterenae Taylor

TCWC (6), Tropical Deciduous, Pine-oak and Cloud forests. Acahuizotla, 2800 ft (1 juv.); Agua del Obispo 3300 ft (1♂); 3 mi W Chilpancingo, 5000 ft (1♀); 4 mi W Mazatlán, 7800 ft (1♀, 2 yg.). Other records: 7 mi E Chilpancingo; Chilapa (Smith and Taylor, 1950). Mazatlán; between Rincón and Cajones (Taylor, 1933).

Our specimens were found under rocks or rotting logs at elevations varying from 2800 feet to 7800 feet. Adult females taken in June appeared to have oviposited earlier in the season; one recently hatched juvenile 25 mm in snout–vent length was captured 18 June. The largest specimen, a female that has nearly lost the white dorsolateral stripes, measured 64 mm in snout–vent length.

Family TEIIDAE Gray

Ameiva undulata dextra Smith and Laufe

TCWC (15), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (4♂♂, 2♀♀); Agua del Obispo, 3300 ft (1♂); mountains W of Agua del Obispo, 4000 ft (1♂); Almolonga, 5800 ft (3♂♂, 1 juv.); 5 mi W Chilpancingo 6000 ft (1♂); 1 mi SW Colotlipa, 2700 ft (1♂); 1 mi SW Tierra Colorada, 900 ft (1♂). Other records: Los Cajones (Gadow, 1905); Chilpancingo (Smith and Taylor, 1950); near Rincón (Smith and Laufe, 1946).

This species occupies an altitudinal range in southern Guerrero from near sea level to at least 6000 feet in the vicinity of Chilpancingo. Most of our specimens were found in rocky terrain. These lizards apparently are not common wherever they occur, and they seem to be much more shy and retiring than the related *Cnemidophorus.*

Little information is available on their breeding habits. Large males taken in late June and early July had enlarged testes; females, however, had small ovarian follicles. A young lizard 42 mm in snout–vent length was taken 1 July.

Adult males varied from 76 to 97 mm in snout–vent length; our two females measured 60 mm and 80 mm, respectively.

Cnemidophorus guttatus immutabilis Cope

TCWC (90), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (32♂♂, 23♀♀); Agua del Obispo, 3300 ft (13♂♂, 4♀♀); mountains W of Agua del Obispo, 4000 ft (1 juv.); 1 mi SW Colotlipa, 2700 ft (4♂♂, 4♀♀); 1 mi SW Tierra Colorada, 900 ft (1♂, 2♀♀); 5 mi SW Tierra Colorada, 1000 ft (3♂♂, 3♀♀). Other record: Tierra Colorada (Gadow, 1905).

In our series of 116 specimens of this species from Guerrero, all of them from elevations above 1000 feet are distinctly striped; a few adult males from near Acapulco are spotted with obscure lines. Adults from Acahuizotla, Agua del Obispo, and Colotlipa, at elevations above 2600 feet, are strikingly marked by a broad cream-colored stripe that sets them apart from all other specimens of this species we have seen. Further collecting at middle altitudes on the Pacific slope of the Sierra Madre del Sur may reveal that this sample represents an unnamed geographic race.

Most of the adult females taken in June were gravid; a newly hatched juvenile (snout–vent length 35 mm) was captured in the mountains west of Agua del Obispo on 24 June.

Cnemidophorus gigas Davis and Smith

TCWC (23), Tropical Deciduous and Chaparral-oak forests and Arid Tropical Scrub. 3 mi W Chilpancingo, 5000 ft (1♂, 1♀); 4 mi W Chilpancingo, 5800 ft (6♂♂, 3♀♀); 5 mi SW Chilpancingo, 6000 ft (1♂); 1 mi SW Colotlipa 2700 ft (6♂♂, 2♀♀); Mexcala, 1600 ft (1♀); 5 km S Puente de Mexcala, 1800 ft (2♂♂).

This species is probably widely distributed in the Balsas Basin and its extensions through such low passes as the valley of Colotlipa onto the Pacific slope of the Sierra Madre del Sur. Wherever found it is associated with rocky terrain and xeric chaparral.

Davis and Smith (1952) point out that this species appears to breed earlier in the season than *C. sacki.* One female taken 25 June at Colotlipa contained six eggs (12 mm × 20 mm) nearly ready for deposition.

Cnemidophorus deppei deppei Wiegmann

TCWC (32), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 1000 ft (6♂♂); 5 mi SW Tierra Colorada, 1000 ft (17♂♂, 5♀♀); 5 mi SE Tierra Colorada, 1000 ft (4♂♂). Other records: Organos, Xaltinanguis (Duellman and Wellman, 1960).

All except two of our adult male specimens have bluish gray throats. The dorsal count varies from 93 to 112 granules and falls well within the range of variation recorded by Duellman and Wellman (*op. cit.*) for the Guerreran population. Femoral counts varied from 37 to 40, slightly higher than the recorded average of 35.9 (32–42).

Cnemidophorus deppei infernalis Duellman and Wellman

TCWC (6), Arid Tropical Scrub. Mexcala, 1600 ft (1♂, 2♀♀); 5 mi S Puente de Mexcala, 1800 ft (3♀♀). Other records: 3 km S Mexcala, 14 km N Zumpango del Rio (Duellman and Wellman, 1960).

All of our specimens, three of which are from the type locality, agree with the characters designated for this subspecies by Duellman and Wellman.

Cnemidophorus sacki sacki Wiegmann

TCWC (51), Arid Tropical Scrub, Tropical Deciduous and Chaparral-oak forests. 2.5 mi S Almolonga, 5600 ft (7♂♂, 4♀♀); 3 mi W Chilpancingo, 5000 ft (1♂); 4 mi W Chilpancingo, 5800 ft (8♂♂, 2♀♀); 1 mi SW Colotlipa, 2700 ft (7♂♂, 3♀♀); Mexcala, 1600 ft (10♂♂, 6♀♀); 5 mi S Puente de Mexcala, 1800 ft (3♀♀). Other records: Chilpancingo, Río Balsas, Rincón (Gadow, 1906).

Eight of the 36 males ranged from 100 to 108 mm in snout–vent length, the others ranged from 80 to 98 mm. Females ranged from 60 to 90 mm in snout–vent length ($M = 73.7$). In the last half of June, the younger females (60–72 mm) contained two to four eggs, 1 to 8 mm in diameter; older females (75–90 mm) contained four to six eggs from 7 to 10 mm in diameter. This species was the most common lizard encountered in localities from which it was taken.

Family ANGUIDAE Cope

Abronia deppi Wiegmann

TCWC (1♀), Pine-oak and Cloud forests. 1 mi SW Omiltemi, 7700 ft. Other record: Omiltemi (Smith and Taylor, 1950).

Our female, which was found on the trunk of a tree on 10 June, contained enlarged ovarian follicles. Snout–vent length, 63 mm; tail, 90 mm.

Barisia gadovi gadovi Boulenger

TCWC (15), Pine-oak and Cloud forests. 4–5 mi W Mazatlán, 7800–8000 ft (4♂♂, 1♀, 1 juv.); Omiltemi 7600 ft (1♀); 2.5 mi W Omiltemi, 8500 ft (5♂♂, 2♀♀); 2 mi SW Omiltemi, 7800 ft (1♀). Other records: Chilpancingo (Tihen, 1949); mountains W Chilpancingo (Smith and Taylor, 1950); vicinity of Chilpancingo (Hall, 1951).

Our specimens were all found on or near the ground in the coniferous forests at high elevations in June. None of the females had ova larger than one millimeter in diameter, but several of the larger males had enlarged testes. Snout–vent length of adult males ranged from 90 to 101 mm; of females 85 to 93. A juvenile taken 24 June measured 35 mm.

Tihen's (1949) report of specimens from Chilpancingo most certainly does not refer to the immediate vicinity of that town which is in a valley surrounded by xeric conditions.

Gerrhonotus liocephalus liocephalus Wiegmann

TCWC (2♀♀), Pine-oak and Cloud forests. Acahuizotla, 2800 ft. Other record: Omiltemi (Gadow, 1905; Smith and Taylor, 1950).

Our two specimens came from the mixed pine-oak forest a short distance west of the village of Acahuizotla. The adult female is 153 mm in snout–vent length; the tail, 170 mm. The juvenile is 83 mm from snout to vent. The adult, taken 21 July, had small ovarian folilcles.

Family HELODERMIDAE Gray

Heloderma horridum Wiegmann

TCWC (1 yg.), Tropical Deciduous forest. 1 mi SW Colotlipa, 2700 ft (collected 30 June 1953). Our specimen, 212 mm in total length (130 mm S–V length), is brilliantly colored yellow and black. The middorsum has eight bright yellow spots in a row from rear of head to base of tail. The tail has five bright yellow crossbands, slightly narrower than the black interspaces. The testes are two millimeters in diameter.

Family KINOSTERNIDAE

Kinosternon integrum Le Conte

TCWC (15), Tropical Deciduous and Chaparral-oak forests. Acahuizotla, 2800 ft (5♂♂, 5♀♀, 1 yg.); 1 mi SW Colotlipa, 2700 ft (2♂♂, 1♀); 2.5 mi S Almolonga, 5600 ft (1♂). Most of our specimens were collected along a small stream near the village of Acahuizotla. The single specimen from near Almolonga was taken from a small pond after a heavy rain.

Measurements (in mm) of six adult males and six adult females are as follows, males and females, respectively: Length of plastron, 123–157 (M = 138.7), 103–145 (M = 127.0); width of fore lobe of plastron, 67–76 (M = 71.7), 54–77 (M = 66.7); width of hind lobe of plastron, 63–72 (M = 66.7), 51–74 (M = 64.2); width of bridge, 36–44 (M = 38.9), 28–45 (M = 38.7); width of carapace, 85–108 (M = 94.5), 80–101 (M = 89.3); length of carapace, 137–175 (M = 156.9), 110–158 (M = 137.2); depth of shell, 50–62 (M = 55.2), 41–60 (M = 53.5). Females average smaller in size, but the width of the plastral bridge is proportionally larger than that of the males. All adult males have well-developed claws on the front feet. Seemingly there are no other records of this species, nor of any other turtle, from the Chilpancingo region.

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SYNONYMICAL NOTES ON SOME SOUTH AMERICAN SPECIES OF *GELASTOCORIS* KIRKALDY (HEMIPTERA: GELASTOCORIDAE)

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De Carlo, 1954, Misión de Estudios de Patología Regional Argentina, 24(83–84): 87–102, proposed eight new specific names in the Gelastocorinae (Gelastocoridae: Hemiptera). In 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 332–335, 336–337, 339–342, I treated his names as synonyms of *Gelastocoris nebulosus* (Guérin-Méneville), *G. fuscus* Martin and *G. angulatus* (Melin). The latter species and its synonyms were placed by De Carlo in the genus *Montandonius* Melin. I treated *Montandonius* as, and still consider it to be, a junior synonym of *Gelastocoris* Kirkaldy. De Carlo has recently published, 1959 (1960), Acta Zoologica Lilloana, 17: 53–85, a second paper in which he maintains that most of his specific names apply to valid species and that *Montandonius* Melin (1929: 154, 169) is a distinct genus. He also proposes another new specific name, *Gelastocoris monrosi.*

After a careful review of De Carlo's papers and a restudy of the species concerned, it is very obvious that we have very different concepts of species insofar as the Gelastocorinae are concerned. Accordingly, I do not wish to become further involved in an argument based on differences of opinion. However, since De Carlo has utilized some different characters in defining his species in his second paper, since he has modified some of his original illustrations and included additional ones, and since his names must be treated in a checklist of the family, now in preparation, I feel obligated to discuss his names once more. I shall then trust to other workers in Hemiptera, both of the present and future, and to future developments in our knowledge of the Gelastocoridae to determine which of the two specific concepts is correct.

Four of the names proposed by De Carlo in 1954, *i.e., Gelastocoris vianai, G. bergi, G. paraguayensis* and *G. bolivianus,* are in my opinion synonyms of *G. nebulosus* (Guérin-Méneville) and were so placed by me in 1955. The new name proposed by De Carlo in his last paper, *Gelastocoris monrosi,* I also place in the synonomy of *nebulosus,* but I must admit that I do not now have specimens that agree in all respects with those so named by De Carlo.

The male genitalia of *nebulosus* differs from those of the other species in that the tumescence of the right clasper is adnate to the base of the clasper; the pan more or less flat, wider than long and truncate or slightly rounded apically; the keel hook recurved back across the pan; and the right clasper hook, stout, with a large lateral projection which gives the hook a footlike appearance. The male genitalia of all five of the De Carlo species mentioned above agree with those of *nebulosus.* The slight differences in the shape and size of the keel hook which De Carlo considers in his latest paper to be constant, but which he did not mention or illustrate in his first paper, are in my opinion merely variations of this structure within the species *nebulosus.* Martin (1929: 356) was of the same opinion. He stated: "The hook on the distal end of the keel (keel hook) has a characteristic shape for each species that possesses it. In some species there is quite a range of variation in the size of this hook. In the species *G. quadrimaculatus* (Guer.) the size and shape might be quite misleading unless one is familiar with the species." *G. quadrimaculatus* (Guer.) is the name Martin used for *nebulosus*! Unfortunately, in 1954, De Carlo overlooked the generic revision by Martin.

G. nebulosus (Guérin-Méneville)

De Carlo treated this name as a synonym of *G. flavus* (Guérin-Méneville) in 1954, but he reverses the usage in 1959(1960). He follows my explanation (1955: 334–335) as to why the name *nebulosus* must be used for the species. Also he now states that his *vianai* is the "true" *nebulosus* and places *vianai* as a synonym of the latter. So, we are in agreement that *vianai* De Carlo is a synonym of *nebulosus.*

G. quadrimaculatus (Guérin-Méneville)

In 1954 De Carlo followed Montandon (1910: 2) and Hussey (1952:

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70) in considering *quadrimaculatus* to be an older name for *G. vicinus* Champion. However, I showed (1955: 321–322) that his synonomy was extremely unlikely. In his latest paper De Carlo has applied the name to specimens which I consider to be *nebulosus,* but which he insists are specifically distinct. He also places the specimens he identified as *G. flavus* (Guérin-Méneville) and *G. bergi* De Carlo in 1954 as the same species. This last action is difficult to understand because in 1954 he stated that *bergi* differed from *flavus* by the shape of the pronotum, by having the tubercles of the pronotum a little more pronounced, by the crossing of the hemelytra less, by the different shape of the harpes (parameres) and in the presence of granulations numbers 9 and 10 on the hemelytra. Yet he insists that comparable differences of the same structures are of importance in the separation of *quadrimaculatus, nebulosus, bolivianus, paraguayensis* and *monrosi.*

There are two specimens before me that exhibit an identical pattern of coloration to that given by De Carlo for *quadrimaculatus.* One of these, a specimen from Argentina from the Museum of Vienna, Austria, has granulation number 10 present. Therefore one may conclude that the name *quadrimaculatus* might also be applied to the specimens called *bolivianus* by De Carlo, or that the presence or absence of granulation number 10 is not of specific value. The other specimen with the "quadrimaculatus" type of coloration does not possess granulation number 10. The specimen is from Organ Mountains, Minas Gerais, Brazil, and is in the United States National Museum.

G. bolivianus De Carlo

I agree with De Carlo that the blisterlike granulations of the hemelytra of specimens of *nebulosus* from Bolivia are usually more prominent, with numbers 9 and 10 of De Carlo usually developed and with the membrane frequently reduced. I do not, however, consider these variations to be of specific value. Specimens of *nebulosus* from other areas of South America may also have enlarged granulations and may even possess granulations such as 9 and 10, as indicated above in the discussion of *quadrimaculatus* of De Carlo. Some of the other specimens in the United States National Museum from the series from Organ Mountains, Minas Gerais, Brazil, have granulations 9 and 10 slightly developed. The reduction of the membrane is commonly observed in specimens from the Andean regions in other species as well as in *nebulosus.*

G. paraguayensis De Carlo

I have not observed any constant differences in the elevations or depressions of the pronotum or the scutellum in the series of specimens of *nebulosus.* I cannot, therefore, accept De Carlo's statements that there are constant differences in these structures. De Carlo also states that the shape and size of the keel hook is constant for this species and different from *nebulosus, quadrimaculatus,* etc. I have already discussed in this paper the variation of the keel hook in *nebulosus.* De Carlo states, 1959(1960) in "Remarks" under *paraguayensis* that if I had carefully observed his drawing, Fig. 8, Plate 2, p. 91 in his original paper that I would not have considered *paraguayensis* to be a synonym of *nebulosus.* I still fail to see any specific differences in the drawing. The illustration of *paraguayensis,* is smaller than the others, but then the specimen was smaller. Even so, it is only slightly smaller than the illustration of the genitalia of *vianai,* Fig. 10 which De Carlo now claims is the same as *flavus* Guérin-Méneville of De Carlo, 1954, illustrated in Fig. 7.

G. monrosi De Carlo

I place this name also as a synonym of *nebulosus* because the genitalia as illustrated by De Carlo (1959(1960): Figs. 22–25) belong to *nebulosus* as I consider the species. I do not have any specimens before me in which the posterior margin of the seventh abdominal sternite is formed as in Figs. 39 and 40 of De Carlo's last paper. The small specimens from Plaumann, referred to by De Carlo are in the collection of the University of Kansas. I do have three males from the collections of the United States National Museum, from Ceara, Brazil that are even smaller than those called *monrosi* by De Carlo. These range from 5.4 to 5.7 mm in length and 3.7 to 3.8 mm in width. The genitalia are not unlike those figured by De Carlo, but the posterior margin of the seventh abdominal sternite is like that in the larger specimens of *nebulosus.*

In the course of my studies of the Gelastocoridae, I have examined more than 800 specimens of *G. nebulosus* (Guérin-Méneville). It is an extremely variable species. My conclusion that it is a variable species and not a complex is based on the variation found in other species of *Gelastocoris* as well as in *Nerthra* Say, on a comparative study of differences in the male genitalia of the species of *Gelastocoris* and on the lack of constancy of the variations of specimens of *nebulosus.* I am fully aware that complexes of closely related species do occur, in fact, I have named entities that I believed belonged to such complexes. Furthermore, I know that within such complexes, any morphological structure, *i.e.,* male genitalia, may indeed be very similar in the species concerned. Nevertheless, it is my opinion that *nebulosus* does not represent such a complex. It is true that I have not seen, or at least have not recognized, specimens in which the seventh abdominal sternite is modified as described by De Carlo for *monrosi.* If the difference is real and not due to distortion resulting from methods of preservation or preparation, and if it develops that the difference is constant and that the specimens are geographically isolated from *nebulosus,* then *monrosi* should be considered to be a subspecies of *nebulosus.* More collections and further study will be required, however, before the proper status of the name can be determined. Further biological and ecological studies are certainly needed. We know, for example, that some species of *Gelastocoris* sometimes are found in colonies or in aggregates in small areas along the margins of bodies of water. But we do not know whether such aggregations represent the offspring of one or a few females or whether specimens of quite different ancestries have collected in such an area because of an abundant food supply or for some other reason. We do not know, therefore, how to evaluate the individual variations found in such populations. Many other similar problems undoubtedly will need to be resolved before we can accurately discuss the species, subspecies and forms of *Gelastocoris.*

G. martinezi De Carlo

This is clearly a synonym of *G. fuscus* Martin. As stated before, De Carlo was not aware of Martin's study of the genus. Therefore, when De Carlo described *martinezi,* he did not compare it with *fuscus.* In his more recent paper, De Carlo maintains that the two differ in the shape of the right clasper hook and in the shape of the lateral margin of the pronotum, especially the posterior part. The right clasper hook is quite variable in this species as in the other species of *Gelastocoris.* Martin, 1929, illustrated some of the variation found in this species in Figs. 17, 19A and 19B. De Carlo refigured Martin's Fig. 19A, but not 19B which more nearly approaches the shape of the right clasper hook of his *martinezi.* I illustrated another variation, Fig. 40, in 1955. After the examination of one paratype of *fuscus,* De Carlo remarks that my illustration is incorrect, but it was made from one of the specimens in the collection of the University of Kansas. Furthermore, there is a specimen from Rurrenabaque, Beni, Bolivia, in the United States National Museum that has the right clasper hook similarly formed. The right clasper hook is not at all heavily sclerotized in this species. In fact, in some specimens it is rather membraneous basally and along the outer margin. Consequently when specimens are relaxed for dissection, it is frequently found to be extremely pliable and may dry in various positions according to the degree of sclerotization of the hook. A series of males in the United States National Museum collected in Bolivia by W. M. Mann in 1921–22 demonstrate the range of variation to be found in the right clasper hook. In the genitalia of *fuscus* the shape of the pan, the shape of the keel hood and the extent of the fringe of the keel hood are distinctive. The series of males from Bolivia mentioned above also show that the supposed difference in the shape of the lateral margin of the pronotum is not constant and that it too is a variable character.

G. angulatus (Melin)

Three names proposed by De Carlo, *i.e., Montandonius willineri, M. mansosotoi* and *M. bridarollii,* I treated as synonyms of *angulatus* in 1955. I also placed *angulatus* in *Gelastocoris* since I did not consider the differences utilized by Melin and De Carlo to be generic. *G. angulatus* is, indeed, a very distinct species, but I feel the relationship to the other species can best be expressed by including *angulatus* in *Gelastocoris.* The situation is comparable to that of *Nerthra tuberculata* (Montandon) and the other species of the *alaticollis* group in Australia. In 1954 De Carlo stated that one of the main differences between the two genera was that *Montandonius* species lacked a clavus. I pointed out, in 1955, however, that *angulatus* does have a clavus and that the species is variable in the development of the claval suture on the upper surface of the hemelytra. Mr. Izzard of the British Museum (Natural History), at De Carlo's request, confirmed the existence of a clavus in *angulatus*. De Carlo, thus, abandoned this character in his subsequent generic diagnosis, but states that his three species differ from *angulatus* in that they lack a clavus.

G. angulatus does have the apex of the head truncate or slightly concave whereas in the other species of *Gelastocoris* it is rounded. There are six small, longitudinal carinae on the posterior part of the pronotum of *angulatus* which are not found in the other species. The blisterlike granules are mostly elevated in *angulatus*, but the number, degree of elevation and coloration of the granulations is variable. De Carlo has used such differences in separation of his species. In the majority of the other species of *Gelastocoris* the blisterlike granules are only rarely elevated to the degree usually found in specimens of *angulatus*, and even then only a few granulations are elevated. In *G. major* Montandon, however, the blisterlike granules are generally elevated and approach those of some specimens of *angulatus*. The embolium of *angulatus* is usually a little wider than in the other species, but it too is variable and differences in the width of expansion of the embolium have also been used by De Carlo to separate his species. The rugosity of the front of the head is variable as in the other species and not noticeably rougher than some specimens of other species, *i.e.*, *major*, *fuscus* and even *nebulosus*. The lateral expansion of the pronotum is not proportionally greater than that of *bufo*, as has been stated by De Carlo. The posterior portion of the lateral margin of the pronotum is usually more convex than in the other species.

In consideration of the above comments, I feel that generic separation of *angulatus* is not warranted. On the other hand, if I believed that *angulatus* was, in fact, a complex of species, I probably would agree with De Carlo that *Montandonius* should be used to separate those species from the species of *Gelastocoris*. But, I do not consider that De Carlo's names apply to valid species.

M. willineri De Carlo

De Carlo states (1959(1960): 82) that I was in error in treating this species as a synonym of *angulatus* because the shape of the right clasper hook is obviously different according to Figs. 49, p. 76 and 59, p. 81. I admit the figures appear very different, but this is not surprising since they do not represent the same aspect. Figure 49 of De Carlo represents a lateral view, not a ventral view as in Fig. 59. This is certain because the peglike spines of the right paramere occur on the dorsal surface of the paramere and are not visible in a ventral view in *angulatus*. They are shown in the illustration of *willineri*. Furthermore, the right clasper hook of specimens of *angulatus* have the appearance of that figured for *willineri* when viewed from the right side. De Carlo states that he mounted the genitalia of his species on slides, so it seems likely that the genitalia of his single male specimen of *angulatus* (his *willineri*) somehow came to rest so that a lateral aspect was presented. I should also comment at this point that the right clasper hook is also variable in shape and size in *angulatus* as in the other species of *Gelastocoris.* The width of the shaft, the total length and the shape is variable. In one male, now before me, a specimen from Rurrenabaque, Beni, Bolivia, in the United States National Museum, the apical, recurved part is scarcely developed. The other differences between *willineri* and *angulatus,* as well as between *willineri* and the other two De Carlo species referred to *Montandonius,* are in my opinion merely individual variation within the species.

M. mansosotoi De Carlo and *M. bridarollii* De Carlo

I consider the female specimens so named to be *angulatus,* and the differences listed by De Carlo to be only variations found in those species. In his last paper, De Carlo has illustrated, Fig. 56, p. 81, the right ovipositor for his species *mansosotoi.* It should be noted that this figure does not agree with the illustration, Fig. 18, of the ovipositor of the same species presented in 1954. Fig. 56, lacks many of the spines shown in Fig. 18.

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A NEW *CYLINDROSTETHUS* FROM PERU (HEMIPTERA: GERRIDAE)

By Carl J. Drake
Smithsonian Institution

The genus *Cylindrostethus* Mayr (1865) is represented in the Western Hemisphere by seven species, all from the Neotropical Region. The members of the genus are very long, nearly cylindrical, and are the largest of the American water-striders. The type species of the genus is *C. fieberi* Mayr from Ceylon.

The present paper characterizes a new species from Peru, which belongs to the "*regulus* group" of species, the members of which have the seventh sternum in the male with only a broadly rounded excavation on hind margin.

Cylindrostethus stygius, new species

Very long, terete, blackish, rather densely clothed with short, grayish, appressed, pubescent hairs, the hairs on sides of body a little longer than those on dorsal and inferior surfaces; vertex and most of genital segments yellowish brown. Antennae dark brownish fuscous. Legs brownish fuscous, with most of femora, coxae, trochanters, and acetabula yellowish brown; fore femora with front face and inferior side of tibiae blackish. Pronotum, mesonotum, and metanotum with a narrow, longitudinal, dark fuscous stripe on each side. Connexiva brownish to blackish brown with exterior margin blackish fuscous. Pronotum impressed medially, mesonotum and metanotum with impressed, median, longitudinal line. Entire surface feebly shiny, with sides of body slightly silvery. Length 18 mm, width (base of metanotum) 2 mm. Macropterous form unknown.

Antennal measurements: segment I, 2.6 mm; II, 0.8 mm; III, 0.5 mm; IV, 1.28 mm. Rostrum short, with last segment shining black, not reaching to base of head. Legs very long, middle and hind pairs with apices of femora extending considerably beyond tip of last genital segment in male; hind femora only slightly projecting beyond apex of last genital in female, connexiva moderately wide, nearly erect, each terminating behind in a backward-directed spine in both sexes, these spines extending to middle of first genital segment in male, slightly longer in female.

Male: Seventh abdominal sternum deeply, broadly, concavely excavated behind. First genital segment above subquadrate in outline, impressed on each side of median ridge, broadly rounded behind; beneath longer than wide. Second genital segment very long, above strongly compressed laterally at base so as to be ridge-like, thence tapering posteriorly to a point, the lateral processes (one on each side) subtriangular, blackish, shiny.

Female: First genital segment slowly narrowed posteriorly, rounded at apex, beneath longer than above with apex obtusely rounded; second genital segment very long, tapering backwards to a point.

Holotype (male), *allotype* (female): San Alejandro River, Peru, July 1956, F. Woythowski. *Paratypes:* 1 male (genital segments missing) and 4 females, same data as type label. Types in Drake Collection (USNM).

This species belongs to the group of species of *Cylindrostethus* that have the abdominal sternum in male broadly concavely emarginate behind. It differs from *C. palmaris* Drake and Harris, *C. hungerfordi* Drake and Harris, and *C. regulus* (Buchanan-White) by its blackish color, short, grayish pubescence, very narrow, parallel, thoracic stripes (one on each side of dorsal surface), and genital segments as described in the description. The color of the body reminds one of *C. linearis* (Erichson) and related forms, but the members of this group have the hind margin of the seventh abdominal sternum double-emarginate (second notch subquadrate and located at middle of first emargination).

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FURTHER ADVANCES IN THE TAXONOMY AND DISTRIBUTION OF THE GRYLLOBLATTIDAE (ORTHOPTERA)

By Ashley B. Gurney

Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture

In this paper the important developments in the study of the Grylloblattidae since 1953 are summarized. As in my 1953 report and my two earlier ones, new species are described, and recent papers of other authors are cited, with annotations included for some of them.

In addition to the material reported here, some other species have been made available to J. W. Kamp of Redding, Calif., who has a longtime interest in the group, and from whom a valuable contribution may be expected. He was one of the first entomologists to find grylloblattids in caves, a habitat which since has been worked very successfully by several collectors.

Since 1924, when Caudell and King described the first Japanese grylloblattid, it has been apparent that the group once must have had a faunal connection by a Bering Sea land bridge. The notable discovery in 1959, by Robin E. Leech and E. R. MacDougall, of *Grylloblatta* in northern British Columbia, whets the hope that some day a species will be found in Alaska. As recently as 1951, a new genus was described from Siberia by Bei-Bienko, so the tie-in between the Asiatic and American faunas has become much closer than it was 10 years ago. Papers by Griffin (1960) and Simpson (1947) give helpful background on Siberian-Alaskan land connections.

It has become increasingly evident that male genitalia are important in distinguishing species, and that, when more localities and habitats have been examined, many species may be found. Here I have adopted mainly Walker's (1956) terminology for the male genitalia. Thus, "coxopodite" is used in place of the "coxite" of my 1953 paper, "first accessory copulatory process" in place of "accessory sclerite of right phallomere," and "principal copulatory sclerite" instead of "main phallic sclerite." In lieu of the last-named, Walker used "process" instead of "sclerite," but I prefer "sclerite" for the sclerotized structure, with "process" for the pointed apical portion.

As with my earlier papers, the interest and cooperation of numerous individuals enable me to report on significant discoveries made by them by virtue of hard work in the field. I am deeply indebted for the sustained help of the following persons, as well as for the privilege of retaining specimens for the National Museum: Thomas C. Barr, Jr., Tennessee Polytechnic Institute, Cookeville; M. Chûjô, Kagawa University, Takamatsu-shi, Japan; David G. Fellin, John D. Lattin, and H. A. Scullen, Oregon State College, Corvallis; W. J. Gertsch, American Museum of Natural History, New York, New York; Wm. R. Halliday, Seattle, Washington; George P. Holland and John E. H. Martin, Canadian Department of Agriculture, Ottawa; K. Morimoto and K. Yasumatsu, Kyushu University, Fukuoka City, Japan; Harry Reese and his family, Ariel, Washington; Vincent D. Roth, El Centro, California; E. M. Walker, Toronto, Canada.

GRYLLOBLATTA Walker

Grylloblatta washoa, new species

(Figs. 10–17)

Male (holotype): Size medium for genus; minutely pubescent; major body setae inconspicuous; antennae with 28 segments (left), 23 (right, broken); compound eye (Fig. 10) about as in *rothi*; pronotum with greatest width nearly as much as length (see measurements), proportionately less elongate than in *rothi*; leg ratios (length divided by width) as follows: front femur, 3.2; hind femur, 4.6; front tibia, 5.5; hind tibia, 9.4.

Supra-anal plate (Fig. 12) with posterior margin weakly asymmetrical, less so than in *rothi*, anterior margin strongly asymmetrical; left coxopodite about as in *rothi*, but left stylus borne basally (Fig. 15); right coxopodite lacking strong lateral setae, and with stylus short and borne basally (Fig. 16); principal copulatory sclerite differing from *rothi* in that apex of copulatory process (Fig. 13, *e*) is less elongate and the lateral margin is less protruding; apical process of first accessory copu-

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latory process (Fig. 11) more sharply constricted at base than in *rothi*, and the apex nearly truncate; hooklike apical process of second accessory copulatory process (Fig. 14) much as in *rothi* (Fig. 9); cerci (Fig. 17) with few major setae (others broken?), segments in apical half proportionately more elongate than in *rothi*.

Coloration: General coloration pale straw, major leg spurs somewhat darker; thoracic nota, antennae and cerci very pale; segments of latter whitish basally and apically as shown by dotted areas in Fig. 17; eyes black.

Measurements (length in millimeters): Body, about 22; antenna, about 9; eye, 0.6; pronotum, 2.3; hind femur, 3.2; hind tibia, 3.3; cercus, 4.0; width of head, 2.4; of pronotum, 2.2; of hind femur, 0.7.

Type: American Museum of Natural History. A male from Echo Summit, 7,382 ft altitude, 4 miles south of Meyers, Eldorado County, California. Collected 9 September 1959, by Willis J. Gertsch and Vincent D. Roth. Echo Summit, a high point on Highway 50, is near Echo Peak, which is about one mile directly north of Upper Echo Lake.

Three nymphs, ranging in length from 4 to 8 mm, were collected with the type. Mr. Roth has written me that the specimens were "dug out from a shaded three-foot-diameter rotten log which was buried one-third by soil, leaf mold, and bark. The specimens were in the lower one-third in a very damp, cold and dark habitat. The location was no more than 100 feet from the paved highway."

In my 1953 key to the species of *Grylloblatta*, *washoa* runs to *bifratrilecta*, from which it differs in being smaller, with the cerci shorter as a whole as well as with respect to individual segments. The styli of *washoa* also are shorter. The supra-anal plate of *bifratrilecta* is similar but differs in details, as the original 1953 figures show. The cerci and general habitus of *washoa* suggest close relationship to *rothi*, but the latter differs in the laterally attached styli, in the shape of the supra-anal plate, and in the proportionally shorter segments in the apical half of the cercus.

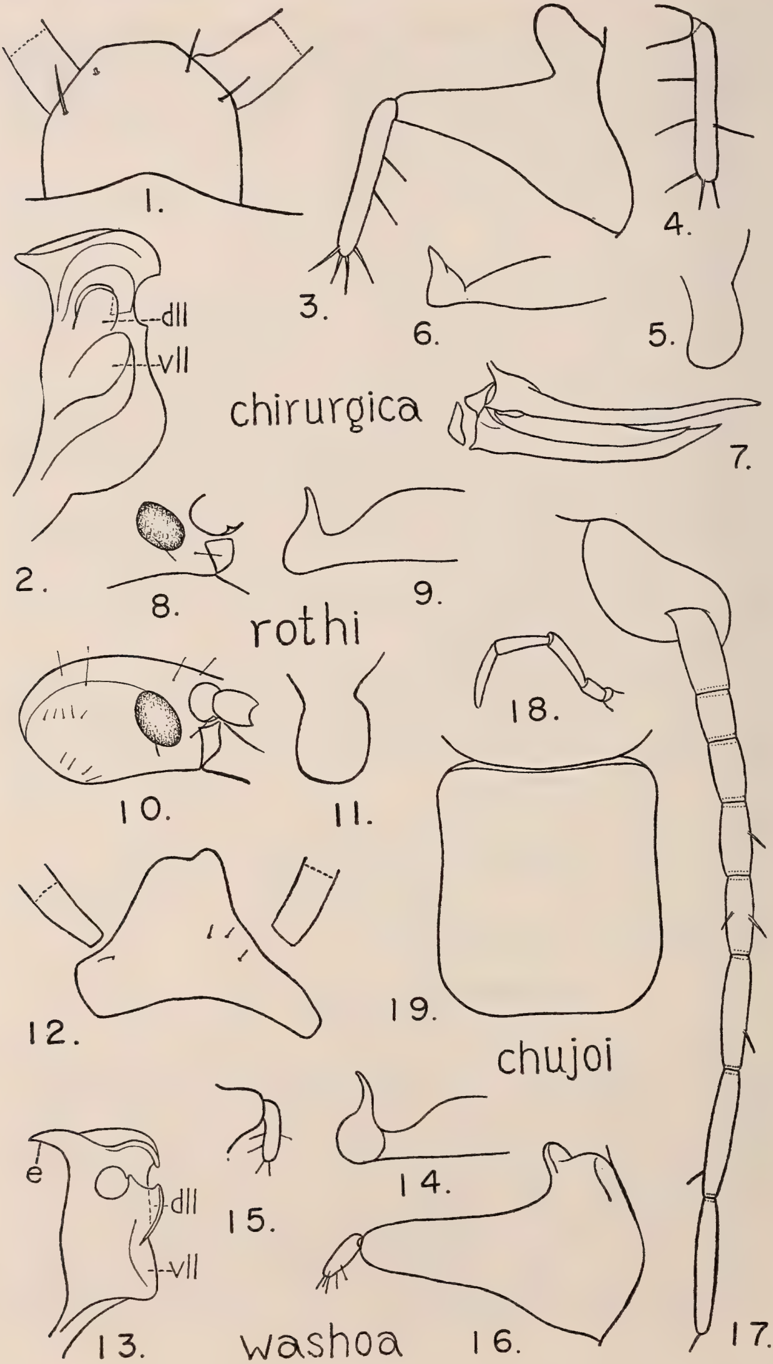
The specific name refers to the Washo people, a small Indian tribe which occupied the upper drainage of the Truckee and Carson Rivers, including the area around Echo Peak.

Grylloblatta chirurgica, new species

(Figs. 1–7)

Male (holotype): Size medium for genus; fine body pubescence moderately conspicuous; major setae well developed; antennae with 29 segments (left), 28 (right, broken); compound eye barely smaller than in *washoa* (as 15 to 17) in greatest length, but much smaller in proportion to head size; pronotum with greatest width one-third of length behind anterior margin; leg ratios (length divided by width) as follows: front femur, 3.5; hind femur, 5.5; front tibia, 6.4; hind tibia, 10.4.

Supra-anal plate (Fig. 1) nearly symmetrical, except at base (normally concealed) which is much extended on left side; left coxopodite with only gently curved mesal margin, with stylus borne basally (Fig. 4);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right coxopodite with numerous pale weak setae and several somewhat stronger setae, scarcely any as strong or heavily pigmented as the weakest major seta of stylus, latter borne basally (Fig. 3); principal copulatory sclerite (Fig. 2) with copulatory process relatively short, dorsolateral and ventrolateral lobes (*dll, vll*) extending laterally from main body of sclerite; apical process of first accessory copulatory process (Fig. 5) narrower than in *washoa;* hooklike apical process of second accessory copulatory process (Fig. 6) with terminal hook shorter than in *washoa.*

Coloration: General coloration yellow straw, major setae and leg spurs darker; thoracic nota darker than abdomen; head light brown, antennae pale; eyes black.

Measurements (length in millimeters): Body, about 17; antenna, about 15; eye, 0.5; pronotum, 3.3; hind femur, 5.0; hind tibia, 3.2; cercus, 7.2; width of head, 3.3; of pronotum, 2.9; of hind femur, 0.9; of hind tibia, 0.5.

Female (allotype): Differing from male in the usual sexual features. Both antennae with 34 segments; leg ratios (length divided by width) as follows: front femur, 3.5; hind femur, 5.5; front tibia, 6.6; hind tibia, 11.2. Ovipositor (Fig. 7) with dorsal valve reaching to apex of segment 5 of cercus, apical fourth of ovipositor with moderate dorsal curvature.

Measurements (length in millimeters): Body, about 18; antenna, about 15; eye, 0.5; pronotum, 3.5; hind femur, 3.9; hind tibia, 5.6; cercus, 6.5; width of head, 3.5; of pronotum, 3.1; of hind femur, 0.9; of hind tibia, 0.5.

Type: U. S. National Museum No. 65377. Ape Cave, Skamania County, Washington, 22 and 28 November 1959, Harry Reese and family.

The allotype and 2 female paratypes were taken at type locality, in the lower part of the cave, where conditions were very wet, with a running stream and constant dripping from the ceiling. Specimens apparently

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Figs. 1–7. *Grylloblatta chirurgica.* Fig. 1.—Dorsal view of supra-anal plate, holotype. Fig. 2.—Lateral view of principal copulatory sclerite, holotype. Fig. 3.—Right coxopodite and stylus, holotype. Fig. 4.—Left stylus, holotype. Fig. 5.—Apical process of first accessory copulatory sclerite, holotype. Fig. 6.—Apical portion of second accessory copulatory sclerite, holotype. Fig. 7.—Ovipositor, allotype.

Figs. 8–9. *G. rothi.* Fig. 8.—Compound eye and associated structures, holotype. Fig. 9.—Apical portion of second accessory copulatory sclerite, holotype.

Figs. 10–17. *G. washoa,* all from holotype. Fig. 10.—Lateral view of head capsule. Fig. 11.—Apical process of first accessory copulatory sclerite. Fig. 12.—Dorsal view of supra-anal plate. Fig. 13.—Lateral view of principal copulatory sclerite. Fig. 14.—Apical portion of second accessory copulatory sclerite. Fig. 15.—Left stylus. Fig. 16.—Right coxopodite and stylus. Fig. 17.—Left cercus.

Figs. 18–19. *Galloisiana chujoi,* all from holotype. Fig. 18.—Left maxillary palpus. Fig. 19.—Pronotum and posterior margin of head. (Parts of principal copulatory sclerite: *dll*—dorsolateral lobe; *e*—apex; *vll*—ventrolateral lobe.) (Drawings by the author.)

were active, as one escaped. Ape Cave, near Cougar, Washington, and more than 2 miles long, is said by Halliday (1959: 38) to be the largest individual lava tube in the United States.

A third female paratype was taken in moss in the twilight zone of Lake Cave, Skamania County, Washington (Sec. 8, T 7N, R 5E), elevation 1,900 ft, 28 December 1958 (W. R. Halliday, collector). In 1958 Halliday found 2 small nymphs, which may be this species, in Nielsen's Cave, which is in Skamania County about 1,000 ft southeast of Big Cave, about 2 miles south of the intersection of a road extending west from Trout Lake and one running south to Willard.

Two of the paratypes have the ovipositor reaching across the basal third of segment 6 of the cercus. There are only 3 unbroken antennae among the paratypes, 2 of them with 34 segments, the other with 33 segments. Size and proportions do not appear to vary significantly from the allotype.

The specific name is adapted from two Latin words, meaning "pertaining to the surgeon," with reference to the great assistance contributed by W. R. Halliday in obtaining specimens. For an introduction to western caves, readers are referred to his recent book (Halliday, 1959).

Grylloblatta sculleni Gurney

Two adult females of *sculleni* taken in the Three Sisters area of Oregon on 1 August 1959, have been examined. One was taken by H. A. Scullen at Scott Camp, the type locality, elevation 6,600 ft. The right and left antennae have 35 and 39 segments, respectively. The other was found by H. H. Crowell at nearby Sunshine Meadow, elevation 6,600 ft. One antenna has 38 segments; the other apparently is broken. Both of the specimens are pale amber, much lighter than the holotype.

A single nymph about 6 mm long, with the following data, has been examined: Oregon, Linn County, Quartzville Creek, one-half mile east of Green Creek (Sec. 26, T 11S, R 4E), elevation 1,900 ft, 14 November 1959, on ground under piece of bark in western hemlock-Douglas fir forest, frost on ground (H. A. Hacker, collector). The nymph cannot be identified, and may be either *sculleni* or *rothi.* Both species are known only from altitudes above 6,000 ft, so this new locality for the genus at a decidedly low elevation is of much interest.

Grylloblatta campodeiformis campodeiformis Walker

In 1953 I summarized the Montana records, and Chapman (1953) contributed ecological notes on observations made at several localities in western Montana. Several new records from the vicinity of Missoula and many ecological notes have recently been assembled by David G. Fellin, whose material has been sent to me for examination. Henson has published (1957a, 1957b) results of his studies in Alberta.

A very significant collection questionably identified as *G. campodeiformis campodeiformis* from Summit Lake, British Columbia, on the Alaska Highway, 392 miles from Dawson Creek, was made in 1959 through the diligent efforts of Robin E. Leech. In the absence of an adult male, confirmation of the identification is lacking. Leech collected 23 nymphs ranging from 8 to 15 mm long on 16 June under stones at the snow line, at 4,700 ft elevation; 3 adult females on 20 June on the east slope of Mt. St. Paul; and one adult female on 21 June at 5,400 ft elevation. E. E. MacDougall collected 2 adult females on 19 June.

Several structures of the Summit Lake species appear to have slightly different proportions from Montana examples of *campodeiformis.* Many measurements have been made, and the front and hind femora average more slender in the northern population. However, it is not entirely certain that the Summit Lake species warrants a different name. That is particularly true because very little material from the Banff area of Alberta, type locality for *campodeiformis,* has been available to me for comparison. A male from Summit Lake might clarify the situation quickly.

Summit Lake is in northern British Columbia about 450 miles northwest of the Jasper Park area of Alberta, previously the most northern locality for *Grylloblatta.* Interruptions in the main mountain ranges between those two areas suggest that isolation may have been a factor in speciation, if subsequent material demonstrates the existence of distinct entities.

Grylloblatta sp.

What may prove to be a new species occurs about 8 miles west of Wallace, Shoshone County, Idaho. Material collected by David G. Fellin includes one adult female and two small nymphs taken 21 November 1959, and two female nymphs each about 15 mm long, collected 21 December 1959. This is the first record of the family in Idaho. The specimens were all found under rocks in the Coeur d'Alene National Forest at a point about one mile northwest of Polaris Peak, and near where the West Fork of Big Creek joins Big Creek.

The body length of the female is about 18 mm, each antenna has 38 segments, and the ovipositor reaches to the middle of the 4th cercal segment. The apical third of the ovipositor shows significant dorsal curvature, whereas that of *campodeiformis* is nearly straight. The species runs near *sculleni* and *barberi* in my 1953 key, and males are needed for best comparisons of these species. Although the two female nymphs are the same size, it is interesting that one has 37 and 38 segments in right and left antennae, respectively, whereas the other has 29 and 28. The latter specimen may be an earlier instar, in spite of size similarity and almost no difference in ovipositor development. The alimentary tract of one of the nymphs taken 21 November measuring 5 mm in length, contains tiny fragments of arthropod sclerites.

Galloisiana chujoi, new species

(Figs. 18–19)

Female (holotype): Size medium to large for genus; fine body pubescence and major setae conspicuous; antennae with 43 segments (left), 36 (right, broken), third segment slightly over twice length of second (as 18 to 7, left; 18 to 8, right); penultimate (4th) segment of maxillary palpus subequal to length of 3rd, as measured along ventral margin (Fig. 18); compound eye absent, with no trace of facets or dark pigmentation, but with slightly paler scelrotization in vicinity of the more dorsal of 2 genal setae corresponding to ocular setae of *nipponensis,* suggesting rudimentary internal light-sensitive organ; pronotum with posterior lateral angles well-rounded, greatest posterior width slightly more than greatest anterior width (as 35 to 34) (Fig. 19); legs more elongate than in type of *nipponensis* (see below).

Abdomen similar to *nipponensis*; cercus with segments comparable to *nipponensis* in slenderness, comparative lengths of the 8 segments as 41, 27, 37, 42, 47, 50, 50, 45; ovipositor with apex of dorsal valve extending to a point across basal one-fourth of segment 4 of cercus.

Coloration: General coloration yellow-amber; head and pronotum noticeably darker; setae pale brown.

Type: U. S. National Museum No. 65378. Female from Oninoiwaya Cave, Megi-shima, Kagawa Prefecture, Japan, collected 2 April 1957, by T. Fujisawa. Megi-shima, about 34° 25′ N Lat., is a small island about 8 miles from the nearest point on Honshu, and about 2.5 miles north of the city of Takamatsu, which in turn is on the north coast of the middle Japanese island of Shikoku.

The type is the only specimen I have examined. It was briefly described, but not named, by Chûjô (1958). Kawasawa (1950) reported, but did not name, a male grylloblattid collected 6 August 1949, crawling beneath a damp stone about 50 meters from the entrance inside Rakan Cave, Ehime Prefecture, a few miles south of Yusahara, in southwestern Shikoku. The cave is in a limestone formation. Through the cooperation of Chûjô, I have learned that this male is preserved in the Entomological Laboratory of Kyushu University, and Morimoto of that Laboratory has furnished detailed drawings of the specimen. These drawings show that the specimen is immature, probably in the instar immediately preceding maturity, and I cannot identify it to species. Chûjô has written me of finding nymphs beneath pieces of limestone on Mt. Tsurugi, Tokushima Prefecture, Shikoku, though he pointed out the difficulty of finding specimens.

The species which evidently is most closely related to *chujoi* is *Galloisiana notabilis* (Silvestri), based on a male nymph, without eyes, taken under a stone at Michino-o, a village near Nagasaki, Kyushu. The latter is the southernmost major island of Japan, and the type locality is some 275 miles from Megi-shima. Because of the immaturity of *notabilis,* a satisfactory comparison cannot be made, but Silvestri's figures show the 4th segment of the maxillary palpus decidedly shorter than the 3rd segment, and the 3rd antennal segment less than twice the length of the 2nd antennal segment. The discovery of topotypic adults of *notabilis* and their description to provide fuller information on the characters of that species are critically needed.

Galloisiana nipponensis (Caudell and King), of Honshu, has small but distinct compound eyes, and the ovipositor extends to about the middle of the 3rd cercal segment, thus being proportionally shorter in comparison to the cercus than the ovipositor of *chujoi.* The legs of *nipponensis* appear more robust than those of *chujoi,* as demonstrated by the following ratios of length divided by maximum width, measured from holotypes of the two species: Front femur, *nipponensis* 2.13, *chujoi* 2.9; hind femur, *nipponensis* 2.46, *chujoi* 4.4; front tibia, *nipponensis* 4.16, *chujoi* 6.4; hind tibia, *nipponensis* 6.83, *chujoi* 10.0.

Two species of *Galloisiana,* recently described from the mountains of Honshu by Asahina (1959), are compared with *chujoi* on the basis of their descriptions. *G. yuasai* is described as a smaller species with only 31 to 35 antennal segments. The eyes, though usually well-pigmented, are said to be sometimes quite absent. Asahina shows that the pronotum of *G. kiyosawai* is as broad as long, and the 3rd antennal segment is 3.5 to 4 times as long as the second segment. He also refers to topotypes of *nipponensis,* and it is hoped that future studies will analyze the limits of variation in the various Japanese species.

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TAXONOMIC NOTES ON THE TUNDRA VOLE (*MICROTUS OECONOMUS*) IN ALASKA

By John L. Paradiso and Richard H. Manville
Bureau of Sport Fisheries and Wildlife

This study was undertaken to determine the subspecific status of several hundred Alaskan tundra voles (*Microtus oeconomus*) submitted for identification by the University of Alaska. During the course of the investigation, 1236 specimens were examined, mostly in the collections of the U. S. National Museum. The type specimens of all the named forms have been examined, with the exception of *M. o. punukensis*, for which a good series of topotypes was available. For the loan of specimens in their charge, appreciation is extended to: A. W. F. Banfield, National Museum of Canada (NMC); William H. Burt, Museum of Zoology, University of Michigan (UM); E. Raymond Hall, Museum of Natural History, University of Kansas (KU); Ludwig J. Rowinski, University of Alaska (UA); and Richard G. Van Gelder, American Museum of Natural History (AMNH). This material was deemed sufficient to give a satisfactory picture of the distribution of the Alaskan forms of the species.

Standard cranial measurements were taken with a vernier caliper. The average larger size of males necessitated recording the measurements of the sexes separately, and where two sets of measurements are given, those for the males precede those for females. External measurements were taken in the flesh by the collectors, unless otherwise noted. All measurements are in millimeters unless otherwise stated. Color comparisons were made only on adult specimens in summer pelage. Capitalized color terms are from Ridgway (Color Standards and Color Nomenclature, 1912).

Microtus oeconomus (Pallas, 1776)

Mus oeconomus Pallas, Reise durch Verschiedene Provinzen des Russischen Reichs, III: 693, 1776.

According to Ognev (1944: 165), *Mus oeconomus* of Pallas (1776) is not *Mus oeconomus* of later authors. He suggests that the name was based on a form of *Mus* (*Stenocranius*) *gregalis,* and proposes to use the name *Microtus ratticeps* for the present species. The usage of Ellerman and Morrison-Scott (1951: 705) and other authors such as Vinogradov and Argyropulo (1941: 205), and Kuznetzov (1944: 351) has been followed, however, in retaining the specific name *oeconomus* in this study.

The tundra vole is described by Hall and Cockrum (1953: 423) as varying in total length from about 160 to 225 mm, with a tail length of 36 to 53 mm and a hind foot measurement from 20 to 24 mm. The upper parts vary from dusky gray through rich buff, tawny or cinnamon brown and rusty brown. In all, there is a mixture of black-tipped hairs; sides paler, with the abdomen white, and in some subspecies washed with buff. The tail is bicolored, dusky to black above, whitish to pale buff below. The anterior lower molar (m_1) has only four closed triangles, the fifth triangle being open and confluent with short terminal loop (except in *M. o. sitkensis,* where the fifth triangle is usually closed). The incisive foramina are short and constricted posteriorly.

As pointed out by Zimmermann (1942) and confirmed by Rausch (1950), the species is holarctic in distribution. The differences between specimens from opposite sides of the Bering Sea, in eastern Siberia and western Alaska, are insufficient for specific separation of the two populations. It was found, in fact, that the two populations are so similar that even subspecific separation is questionable.

Geographic variation in the New World forms is slight. Some characters in which significant geographic variation is exhibited are: The size and shape of the auditory bullae; length of upper molar toothrow; shape of interparietal; slope of occipital plane; coloration; tail length, and over-all size of the animal. In general, it may be said that there is a cline for darker coloration and rounder, more inflated auditory bullae, from west to east. All insular forms examined are larger than mainland forms.

The distribution in Alaska of the ten recognized subspecies is indicated on the accompanying map, p. 83.

Microtus oeconomus operarius (Nelson)

Arvicola operarius Nelson, Proc. Biol. Soc. Wash., 8: 139, 28 December 1893.

M[*icrotus*] *oec*[*onomus*] *operarius,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Microtus kadiacensis Merriam, Proc. Biol. Soc. Wash., 11: 222, 15 July 1897. (Type from Kodiak Island, Alaska.)

Microtus oeconomus gilmorei Setzer, Proc. Biol. Soc. Wash., 65: 75, 25 April 1952. (Type from Point Lay, 163° 04′ W Long. and 69° 46′ N Lat., Alaska.)

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Type: No. 14379/22225, U. S. National Museum; immature skin and skull, collected at St. Michael, Norton Sound, Alaska, in November 1879, by E. W. Nelson, original number 122.

Distribution: Southern and western mainland Alaska, from Point Lay on the NW coast to Ophir and Takotna on the east, south to the north shore of Prince William Sound, including Kodiak and Afognak Islands.

Coloration: The adult summer pelage of the upperparts is between Snuff Brown and Bister; abdomen pale, grayish white, lightly washed with buff.

Molar tooth pattern: Four closed triangles on m_1, two inner and two outer, and usually one unclosed inner triangle; m^3 with three triangles, generally closed, with normally three inner and three outer salient angles.

Measurements: The averages and extremes of nine adult males and five adult females from the type locality are as follows: Total length 170 (167–181), 169 (165–176); tail 44 (36–49), 44 (40–48); hind foot 20 (19–22), 20 (19–21); condylobasal length of skull 27.5 (26.8–28.9), 26.3 (25.5–26.9); zygomatic breadth 15.5 (14.8–16.5), 14.8 (14.4–15.0); least interorbital breadth 3.5 (3.2–3.8), 3.4 (3.2–3.5); mastoidal breadth 11.9 (11.6–12.7), 11.3 (11.0–11.7); length of incisive foramina 5.4 (5.0–5.9), 5.1 (4.9–5.2); alveolar length of upper molar toothrow 6.2 (5.9–6.4), 6.0 (5.8–6.4); length of nasals 7.9 (7.5–8.5), 7.3 (6.8–7.7); interparietal breadth 6.7 (5.9–7.8), 7.0 (6.4–7.8); interparietal length 3.5 (3.2–3.9), 3.3 (3.0–3.6).

Measurements of series from Point Lay and from English Bay, Kodiak Island, Alaska, show no significant differences from the topotypes of *M. o. operarius.*

Comparisons: From *M. o. macfarlani, M. o. operarius* may be distinguished by its paler coloration, and the following cranial characters: Skull more lightly built; auditory bullae smaller, less inflated, and more elongated antero-posteriorly; mastoidal breadth relatively less; zygomatic arches flaring anteriorly, rather than parallel-sided.

Comparisons of *M. o. operarius* with other Alaskan forms will be found under accounts of those subspecies.

M. o. operarius was compared with specimens of *M. o. tshuktschorum* Miller 1899, from eastern Siberia, to determine the relationships of the two populations of *Microtus oeconomus* from opposite sides of the Bering Sea. The following Siberian material was examined: Cape Shelagskij, 14; East Cape, 4 (NMC); Emma Harbor, 9. The differences between this Siberian material and specimens of *M. o. operarius* from the Seward Peninsula and St. Michael, Alaska, are slight, and the advisability of recognizing them as two distinct subspecies is questionable. If in the future, when more Siberian material is available for a thorough analysis, they prove to be identical, it will be necessary to consider *M. o. tshuktschorum* Miller 1899, as a synonym of *M. o. operarius* (Nelson) 1893. If *M. o. tshuktschorum* Miller, proves to be identical with *M. o. kamtschaticus* Pallas 1778, as Ognev (1944: 168) contends, then *M. o. operarius* (Nelson), would become a synonym of *M. o. kamtschaticus* Pallas.

For the present, however, owing to the geographic separation of the two populations, the lack of Siberian material for a satisfactory analysis, and the disagreement on the names and distribution of the Asiatic forms, it seems advisable to retain the name *M. o. operarius* for the Alaskan population.

Remarks: Setzer (1952) applied the name *Microtus oeconomus gilmorei* to that population of the species which ranges from the "arctic slope of Alaska from Point Lay on the west at least to Umiat on the east, and from the Meade River on the north at least to the crest of the Brooks Range on the south," and designated Point Lay (163° 04′ W Long. and 69° 46′ N Lat.), Alaska, as the type locality.

Our findings corroborate those of Rausch (1953: 130), who considered *gilmorei* as indistinguishable. The Point Lay material has been examined and found to agree with typical *M. o. operarius* in coloration and in size and shape of the auditory bullae. In fact, the more abundant comparative material of *M. o. macfarlani* and *M. o. operarius* now available shows that many of the diagnostic characters of *M. o. gilmorei* mentioned by Setzer in separating it from *M. o. macfarlani* (longer, narrower auditory bullae; paler, more yellowish coloration; zygomatic arches flaring anteriorly as opposed to nearly parallel-sided) are characters in which *M. o. operarius* differs from *M. o. macfarlani.*

Setzer designated other diagnostic features to distinguish *M. o. gilmorei* from *M. o. macfarlani,* such as: Upper incisors more recurved; maxillary teeth heavier; and skull averaging larger. New comparative material shows that, in these characters, *M. o. gilmorei* falls within the range of individual variation of both *M. o. macfarlani* and *M. o. operarius.*

Bee and Hall (1956: 127) recognize the validity of *M. o. gilmorei,* and give the range as the entire Arctic slope of Alaska. They designate characters to separate it from *M. o. endoecus* (= *macfarlani*) as follows: Smaller size; lambdoidal crest more developed; lachrymal and frontal protuberances sharper; interorbital ridge more pronounced; zygomatic arches thinner; sculpturing of frontal and parietal slightly deeper; and pelage paler.

The paler pelage is a character of *M. o. operarius,* but it is pronounced only in Point Lay specimens. Farther east on the Arctic slope, coloration is as in typical *M. o. macfarlani.* The other characters mentioned either fall within the range of individual variation of both *M. o. macfarlani* and *M. o. operarius,* or are too poorly marked and inconsistent to distinguish *M. o. gilmorei* as a distinct subspecies, and the Point Lay specimens are herein considered to represent *M. o. operarius.*

In southwestern Alaska, the range of *M. o. operarius* includes most of the Alaska Peninsula, and the area as far inland as Ophir and Takotna. Specimens from Kodiak Island and Afognak Island, formerly assigned to *M. o. kadiacensis* Merriam, are indistinguishable from *M. o. operarius* from the type locality.

A specimen from the north shore of Prince William Sound in the collections of the U. S. National Museum, which was the basis for Bailey's extension of the range of *M. o. yakutatensis* westward to this area (1900: 41) was examined and found to differ in no significant way from *M. o. operarius.* This specimen represents at present the easternmost extension of the range of *M. o. operarius.*

Specimens examined: 441, as follows (all from Alaska, and in the collections of the U. S. National Museum): Afognak Island, Litnik, 7; Becharof Lake, 1; Bethel, 11; Chalitna, 3; Chignik, 6; Chogiung, 12; Cold Bay, 3; English Bay, Kodiak Island, 31; Goodnews Bay, 1; Hooper Creek, 14; Hope, Cook Inlet, 5; Igiak Bay, 10; Iliamna Bay, 3; Iron Creek, 3; Kakhtul River, 4; Kodiak (near), 12; Kokwok River, 45; Kruzgamepa Hot Springs, 2; Lake Aleknegik, 3; Lake Clark, 3; Lake Iliamna (near mouth of Nogheling River), 9; Lake Iliamna (Iliamna Village), 1; Nome, 5; Nome River, 10 miles from coast, 7; Nushagak, 3; Ophir, 1; Point Lay, 27; Point Protection, 5; Prince William Sound (N. shore), 1; St. Michael, 41; Sawtooth Mountains (Kigluaik),10; Seward, 3; Takotna, 4; Tyoonok, 32; Uyak Bay, 4; Wales Island, 3.

Microtus oeconomus macfarlani Merriam

Microtus macfarlani Merriam, Proc. Wash. Acad. Sci., 2: 24, 14 March 1900.

M[icrotus] oec[onomus] macfarlani, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Microtus operarius endoecus Osgood, N. Amer. Fauna, 30: 23, 7 October 1909. (Type from mouth of Charlie Creek, Yukon River, about 50 miles above Circle, Alaska.)

Type: No. 9155/37347 U. S. National Museum; adult skin and skull, collected at Fort Anderson, Anderson River, Mackenzie, by R. Macfarlane.

Distribution: Northern and eastern Alaska, Yukon, and Northwest Territories east to Coronation Gulf. In Alaska, the distribution is approximately east of the Utukok River, 200 miles SW of Point Barrow, and the north fork of the Huslia River, south to Mt. McKinley, and Chitina, Alaska, and Kluane in the Yukon.

Coloration: In summer pelage, *M. o. macfarlani* is darker and brighter than *M. o. operarius.* The dorsum is between Mummy Brown and Prout's Brown; pale grayish white, suffused with buff on the abdomen.

Molar tooth pattern: As in *M. o. operarius.*

Measurements: The averages and extremes of 13 males and 19 females from Bettles are as follows: Total length 176 (155–186), 170 (153–188); tail 51 (44–53), 49 (44–54); hind foot 20 (19–21), 20 (19–21); condylobasal length of skull 29.3 (28.0–30.0), 28.5 (27.0–29.5); zygomatic breadth 16.8 (15.6–17.5), 16.2 (15.1–16.9); least interorbital breadth 3.5 (3.2–3.8), 3.5 (3.2–3.9); mastoidal breadth 12.8 (12.4–13.2), 12.5 (12.0–13.1); length of incisive foramina 5.4 (5.0–5.8), 5.3 (4.2–6.0); alveolar length of upper molar toothrow 6.5 (6.0–6.9), 6.6 (6.0–6.9); length of nasals 8.2 (7.9–8.7), 8.1 (7.5–8.7); interparietal breadth 6.9 (5.8–8.9), 6.9 (5.8–7.8); interparietal length 3.4 (3.2–3.8), 3.4 (2.8–4.0).

Eleven males from Tuktoyaktuk, Mackenzie, measure as follows: Condylobasal length of skull 27.9 (26.9–29.9); zygomatic breadth 15.8 (15.1–17.6); least interorbital constriction 3.7 (3.6–3.8); mastoidal breadth 12.5 (12.1–12.9); length of incisive foramina 5.1 (4.7–5.6); alveolar length of upper molar toothrow 6.3 (6.2–6.4); length of nasals 7.6 (6.9–8.4); interparietal breadth 7.1 (6.7–8.0); interparietal length 3.3 (2.9–3.7).

Comparisons: M. o. macfarlani differs from *M. o. operarius* in the following characters: Auditory bullae larger, rounder and more inflated; skull heavier, more massive; skull broader in the mastoidal region; zygomata parallel-sided as opposed to flaring anteriorly; teeth larger; and coloration darker and brighter.

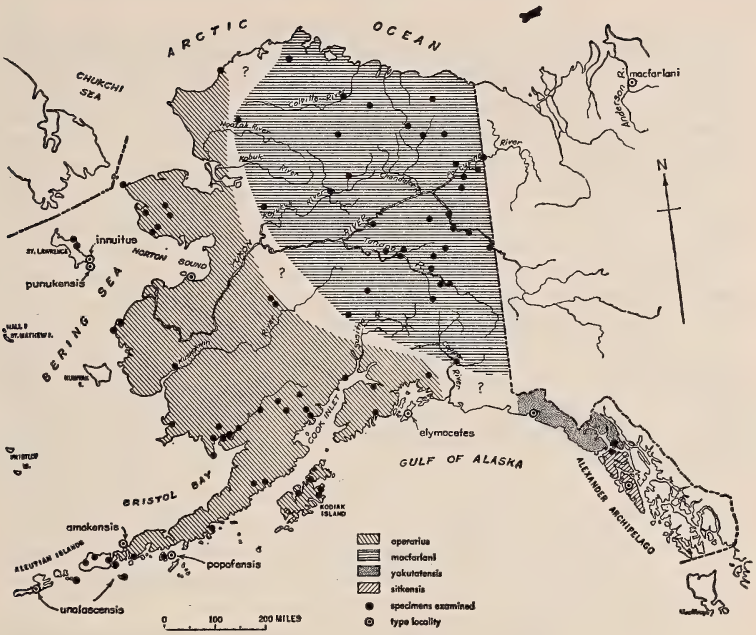
M. o. macfarlani differs from *M. o. yakutatensis* in having a narrower interorbital region; smaller teeth; average smaller and shorter interparietal; less massive skull; and coloration not as dark, and suffused with black.

Remarks: This subspecies is best distinguished near the central portion of its range rather than at the type locality. A large series from Bettles, Alaska, is typical, and is characterized by large, rounded bullae, a broad mastoidal region and dark coloration. Specimens from Circle and Charlie Creek are almost identical. Farther to the east, in the Anderson River region of Mackenzie, which is nearer the type locality of *M. o. macfarlani,* there is a slight but inconsistent tendency toward reduction in the size of the bullae, and skulls average smaller in total length and zygomatic breadth, and are less massive. Nevertheless, the differences are so slight and variable between the Anderson River region specimens and those from Charlie Creek, Alaska (type locality of *M. o. endoecus* Osgood), that we cannot recognize two subspecies within this range, and *M. o. endoecus* Osgood is herein considered a synonym of *M. o. macfarlani.*

Specimens assigned by Setzer (1952) to *M. o. gilmorei* from Utukok River (200 miles SW of Point Barrow), mouth of Chandler River, Anaktuvuk Pass, and Umiat and Killik Rivers, were found to agree with *M. o. macfarlani* and are referable to this subspecies. Representative series from the Arctic Slope, designated by Bee and Hall (1956: 135–136) as *M. o. gilmorei,* were examined and are referable to *M. o. macfarlani,* although specimens from the type locality of *M. o. gilmorei* (Pt. Lay, Alaska) are referable to *M. o. operarius.*

Populations of *M. o. macfarlani* that show intergradation with *operarius* in coloration and size and shape of auditory bullae are from the north fork of the Huslia River, Mt. McKinley and Chitina, Alaska.

Specimens examined: 555, as follows: ALASKA: Alatna, 4; Anaktuvuk Pass, 16; Barter Island, 2; Bettles, 42 (part KU); Chandler Lake, 13 (KU); Chandler River (mouth of), 1; Charlie Creek, 14; Chatanika River, 2; Chitina, 2; Black River, 13 (UA); Circle, 19; Driftwood, 12 (KU); Eagle (mountains near), 31; Elliot Highway, mile 13, 4 (UA); Fairbanks, 2; Huslia River (north fork), 13 (UA); Killik River, 3; Lake


ARCTIC OCEAN
CHUKCHI SEA
BERING SEA
NORTON SOUND
BRISTOL BAY
GULF OF ALASKA
COOK INLET
KODIAK ISLAND
ALEXANDER ARCHIPELAGO
ALEUTIAN ISLANDS
Colville River
Noatak River
Kobuk River
Yukon River
Tanana
Porcupine
Anderson R.
macfarlani
innuitus
punukensis
amakensis
popofensis
unalascensis
elymocetes
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0 100 200 MILES
operarius
macfarlani
yakutatensis
sitkensis
specimens examined
type locality

Gavia, 20 (KU); Lake Schrader, 3 (KU); Little Moose Creek, 2; McDonald Creek, 1; Meade River, 50.5 mi S and 9 mi W of Point Barrow, 3 (KU); Mt. McKinley, 3; Old John Lake, 32 (UA); Old Rampart, 2 (UA); Paxon Region, Denali Highway, mile 1, 1 (UM); Paxon Region, Richardson Highway, mile 179, 1 (UM); Porcupine Lake, 12 (KU); Porcupine River, 5; Richardson 4; Salcha River (headwaters), 6 (UA); Sheenjek River (near Lobo Lake), 2 (UA); Small Lake, 5 (UA); Tanana Crossing, 24; Tanana River and Clearwater Creek (between), 2 (UA); Umiat (near), 22 (part KU); Utukok River, 200 mi SW Point Barrow, 5.

NORTHWEST TERRITORIES: Aklavik, 3 (NMC): Cape Bathurst, 1 (NMC); Coppermine, 2 (AMNH, NMC); Coronation Gulf, 1 (NMC); Fort Anderson, 5; Horton River, Coal Creek, 2 (AMNH); Langton Bay, 32 (AMNH); mouth of Anderson River, 5 (NMC); Reindeer Station, 1 (NMC); Toker Point, 6 (AMNH); Tuktoyaktuk, 44 (NMC).

YUKON: Burwash Landing, 1 (NMC); Coak Creek (head of), 14; Donjek Bridge, 2 (NMC); Kluane Lake (head of), 2 (NMC); Macmillan Pass, Canol Road, 10 (NMC); Old Crow (near), 20; Rampart House, 25 (NMC); Ross River, Canol Road, 7 (NMC).

Microtus oeconomus yakutatensis Merriam

Microtus yakutatensis Merriam, Proc .Wash. Acad. Sci., 2: 22, 14 March 1900.

M[*icrotus*] *oec*[*onomus*] *yakutatensis*, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 98005, U. S. National Museum (Biological Survey Collection); adult ♂ skin and skull, collected on the north shore of Yakutat Bay, Alaska, on 19 June 1899, by A. K. Fisher, original number 2101.

Distribution: From the north shore of Yakutat Bay, south to Point Gustavus. Also reported at Chitina River Glacier, at about 4500 feet elevation, by Laing, Taverner and Anderson (1929: 102).

Coloration: This is one of the darkest American forms of the species, being nearest to Mummy Brown on the dorsum in summer pelage. The abdomen is heavily washed with ochraceous.

Molar tooth pattern: As in *M. o. operarius,* except that frequently four outer and four inner salient angles are present on m^3.

Measurements: The averages and extremes of four adult males and nine adult females from the type locality are as follows: Total length 167 (160–172), 160 (152–168); tail 37 (36–38), 37 (35–39); hind foot 21, 20; condylobasal length of skull 29.1 (28.5–39.5), 27.6 (26.7–28.7); zygomatic breadth 16.5 (16.1–16.8), 15.6 (15.0–15.9); least interorbital breadth 3.8 (3.7–3.9), 3.9 (3.9–4.0); mastoidal breadth 13.1 (13.0–13.3), 12.2 (12.0–12.5); length of incisive foramina 5.1 (5.0–5.2), 5.0 (4.8–5.0); alveolar length of upper molar toothrow 7.0 (6.9–7.1), 6.9 (6.5–7.4); length of nasals 8.0 (7.8–8.2), 7.8 (7.7–8.0); interparietal breadth 7.6 (7.0–7.9), 7.0 (6.8–7.4); interparietal length 4.6 (3.9–5.0), 4.1 (3.9–4.2).

Comparisons: This well-marked subspecies is distinguished from both *M. o. operarius* and *M. o. macfarlani* by its darker coloration and larger molar teeth, as well as its relatively broader mastoidal and interorbital regions.

Remarks: The range of this subspecies has been reported as the "north shore of Prince William Sound" (Bailey, 1900: 40) to Glacier Bay, Point Gustavus. The specimen from the north shore of Prince William Sound was examined and found to be referable to *M. o. operarius.* Specimens from Chitina are referable to *M. o. macfarlani.* Laing, Taverner and Anderson (1929) identified five specimens from Chitina River Glacier, at about 4500 feet elevation, as *M. o. yakutatensis.* These specimens have not been examined, but are presumed to be the ones recorded by Anderson (1947: 200) from near the head of Chitina River, on the west side of Mt. Logan, Alaska. This represents the westernmost, and furthest inland, locality for the subspecies.

Specimens examined: 48, as follows: ALASKA: Glacier Bay, Point Gustavus, 17; Yakutat Bay, 31.

Microtus oeconomus innuitus Merriam

Microtus innuitus Merriam, Proc. Wash. Acad. Sci., 2: 21, 14 March 1900.

M[*icrotus*] *oec*[*onomus*] *innuitus,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 99373, U. S. National Museum (Biological Survey Collection); adult ♂, skull only, collected at Northeast Cape, St. Lawrence Island, Bering Sea, Alaska, on 13 July 1899, by C. Hart Merriam.

Distribution: St. Lawrence Island, Alaska.

Coloration: In summer pelage, darker, more reddish brown than *M. o. operarius*; most nearly approaches *M. o. unalascensis.*

Distinctly melanistic individuals have been recorded by Murie (1934) from several localities in the middle portion of St. Lawrence Island. Others have been taken in the hills south of Savoonga, St. Lawrence Island (Murie, 1936: 345).

Molar tooth pattern: As in *M. o. operarius.*

Measurements: Cranial measurements of the type are as follows: Condylobasal length of skull 33.0; zygomatic breadth 19.5; least interorbital breadth 4.2; mastoidal breadth 15.2; length of incisive foramina 6.3; alveolar length of upper molar toothrow 7.4; length of nasals 9.4; interparietal breadth 8.4; interparietal length 3.7.

There are no external measurements for the series in the U. S. National Museum. Hall and Gilmore (1932: 400) give the external measurements of their series as follows: Total length range from 163 to 220; length of tail average 36.1 (extremes 30–48); length of hind foot 22.2 (extremes 21–24).

Comparisons: M. o. innuitus differs from *M. o. operarius,* the only mainland form with which it needs comparison, in being darker in coloration and larger in size. The auditory bullae, although similar in shape to those of *M. o. operarius,* are relatively larger. The braincase is more angular and more strongly marked by muscular impressions.

Comparisons with *M. o. punukensis* are included under that subspecies.

Specimens examined: 16 skins and 9 skulls from St. Lawrence Island, Alaska.

Microtus oeconomus punukensis Hall and Gilmore

Microtus innuitus punukensis Hall and Gilmore, Univ. Calif. Publ. Zool., 38: 399, 17 September 1932.

M[*icrotus*] *oec*[*onomus*] *punukensis,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 51392, Museum of Vertebrate Zoology; adult ♀, skin and skull, collected on Big Punuk Island, near east end of St. Lawrence Island, Alaska, on 19 August 1931, by Otto Wm. Geist, original No. 2330 R. M. Gilmore.

Distribution: Punuk Islands, Alaska.

Coloration: As in *M. o. innuitus.*

Molar tooth pattern: As in *M. o. operarius.*

Measurements: Cranial measurements of an adult ♀ in the collections of the U. S. National Museum are as follows: Condylobasal length 32.0; zygomatic breadth 17.9; least interorbital breadth 4.1; mastoidal breadth 13.7; length of incisive foramina 5.0; alveolar length of upper molar toothrow 7.4; length of nasals 9.6; interparietal breadth 7.3; interparietal length 3.9.

No external measurements are available for the series in the collections of the U. S. National Museum. Hall and Gilmore (1932) give the external measurements of the type and four female topotypes as follows: Total length 177 (162–196); tail 37.0 (33.0–40.5); hind foot 21.8 (20.0–23.0).

Comparisons: This form is like *M. o. innuitus* in size and coloration, but differs in that the occipital surface of the skull is vertical rather than strongly inclined forward, resembling in this respect *M. o. amakensis* from Amak Island, Alaska. *M. o. punukensis* further differs from *M. o. innuitus* in that, in the former, the interparietal is compressed anteroposteriorly, while in the latter it is large and wedge-shaped.

Specimens examined: 29 from Punuk Island (center island), Alaska.

Microtus oeconomus unalascensis Merriam

Microtus unalascensis Merriam, Proc. Biol. Soc. Wash., 11: 222, 15 July 1897.

M[*icrotus*] *oec*[*onomus*] *unalascensis,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 30772/42672, U. S. National Museum (Biological Survey Collection); immature ♀, skin and skull, collected at Unalaska, Alaska, on 13 August 1891, by C. Hart Merriam, original number z.

Distribution: Unimak, Sanak, Tigalda, and Unalaska Islands, Alaska.

Coloration: Summer pelage similar to *M. o. operarius,* but somewhat darker; dorsal portion of tail darker.

Molar tooth pattern: Upper m^3 as in *M. o. operarius,* that is, with three closed triangles, and three inner and three outer salient angles. Lower m_1 with four closed triangles, two outer and two inner. Usually two open triangles are also formed on the inner side of m_1, but frequently the anterior one is poorly developed, and occasionally it is lacking. The development of the extra unclosed triangle, or loop, on the inner side of m_1, however, is not confined to this subspecies, but is observed in some specimens throughout the range of the species. It is most frequent, and best developed, however, in the southern part of the range, and especially on Unimak, Sanak and Unalaska Islands.

Measurements: Averages and extremes of seven adult males from Unalaska Island are as follows: Total length (average of three) 170 (162–175); tail (average of three) 39 (35–42); hind foot (average of three) 21 (20–21); condylobasal length of skull 29.6 (27.9–31.0); zygomatic breadth 16.9 (15.5–17.5); least interorbital breadth 3.8 (3.7–4.0); mastoidal breadth 13.1 (12.5–13.9); length of incisive foramina 5.0 (4.7–5.2); alveolar length of upper molar toothrow 7.0 (6.8–7.4); length of nasals 8.0 (7.3–8.4); interparietal breadth 6.8 (6.5–7.5); interparietal length 3.7 (3.2–4.1).

The external measurements of an adult ♀ from Unalaska Island are: Total length 162; tail 46; hind foot 21. Cranial measurements of two adult females are: Condylobasal length of skull 28.6, 28.9; zygomatic breadth 15.2, 16.5; least interorbital breadth 3.8, 3.9; mastoidal breadth 12.5, 12.5; length of incisive foramina 5.2, 5.0; alveolar length of upper molar toothrow 7.0, 7.1; length of nasals 7.9, 7.8; interparietal breadth 6.1, 7.4; interparietal length 3.6, 4.0.

Comparisons: Externally this form is like *M. o. operarius,* but is darker in comparable pelage, and has a shorter tail, which is more distinctly bicolored. Cranially, *M. o. unalascensis* differs from *M. o. operarius* in that the auditory bullae are larger, more rounded and inflated, resembling the bullae of *M. o. macfarlani.* The teeth are larger than in *M. o. operarius* and approach those of *M. o. yakutatensis* in size.

Remarks: M. o. unalascensis was thought to be confined to Unalaska Island, but examination of specimens from Sanak and Unimak Islands shows that they too are referable to this subspecies, although the Unimak specimens exhibit intergradation with *M. o. operarius.* Specimens from King Cove, on the southern tip of the Alaska Peninsula, are intergrades with *M. o. unalascensis* in shape and size of auditory bullae but are referable to *M. o. operarius.*

Specimens examined: 76, from Alaska, as follows: Sanak Island, 5; Tigalda Island, 1; Unalaska Island, 46; Unimak Island: False Pass, 6; Ikatan Peninsula, 4; St. Catherine Cove, 7; Urilia Bay, 7.

Microtus oeconomus amakensis O. J. Murie

Microtus amakensis O. J. Murie, Jour. Mamm., 11: 74, 11 February 1930.

Microtus oeconomus amakensis, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5: 309, 17 November 1952.

Type: No. 246449, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on Amak Island, Bering Sea, Alaska, on 8 July 1925, by Donald H. Stevenson, original number 80.

Distribution: Amak Island, Alaska.

Coloration: In summer pelage, almost identical with *M. o. operarius.*

Molar tooth pattern: Like *M. o. operarius* except that frequently four outer and inner salient angles are formed on m^3.

Measurements: The averages and extremes of three adult males and nine adult females are as follows: Total length 189 (179–198), 181 (168–192); tail 49 (44–53), 48 (38–53); hind foot 22 (21–22), 21 (20–22); condylobasal length of skull 29.8 (29.3–30.6), 28.7 (27.9–29.9); zygomatic breadth 17.3 (17.0–17.7), 16.2 (15.8–17.0); least interorbital breadth 4.0 (3.8–4.2), 3.9 (3.8–4.1); mastoidal breadth 13.2 (12.7–13.8), 12.7 (12.2–13.0); length of incisive foramina 4.6, 4.3 (4.0–4.8); alveolar length of upper molar toothrow 6.8 (6.7–6.9), 6.8 (6.5–7.2); length of nasals 8.4 (8.3–8.5), 8.1 (7.8–8.4); interparietal breadth 6.9 (6.7–7.2); 7.0 (6.4–7.5); interparietal length 4.1 (3.8–4.5), 3.9 (3.4–4.4).

Comparisons: Externally this form is like *M. o. operarius,* but differs in that the upper part of the tail and hind feet are paler. Cranially, *M. o. amakensis* averages larger, and has a flattened, vertical occipital surface. The incisive foramina are shorter and more opened than in *M. o. operarius.*

Specimens examined: 33 from the type locality.

Microtus oeconomus popofensis Merriam

Microtus unalascensis popofensis Merriam, Proc. Wash. Acad. Sci., 2: 22, 14 March 1900.

M[*icrotus*] *oec*[*onomus*] *popofensis*, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 97956, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on Popof Island, Shumagin Islands, Alaska, on 16 July 1899, by W. E. Ritter, original number 2200.

Distribution: Known from Popof and Unga Islands, Alaska.

Coloration: As in *M. o. operarius.*

Molar tooth pattern: Similar to *M. o. unalascensis* in that usually two open triangles are formed on the inner side of m_1; frequently, however, the anterior one is poorly developed or is lacking. Upper m^3 is as in *M. o. operarius.*

Measurements: Cranial measurements of the type are as follows: Condylobasal length of skull 31.0; zygomatic breadth 17.6; least interorbital breadth 3.9; mastoidal breadth 13.4; length of incisive foramina 5.9; alveolar length of upper molar toothrow 7.2; length of nasals 9.0; interparietal breadth 7.0; interparietal length 4.4.

A female from the type locality measures as follows: Total length 189; tail 42; hind foot 23; condylobasal length of skull 32.4; zygomatic breadth 18.6; least interorbital breadth 3.8; mastoidal breadth 14.0; length of incisive foramina 7.0; alveolar length of upper molar toothrow 7.4; length of nasals 9.2; interparietal breadth 7.3; interparietal length 4.6.

A male from Unga Island has the following cranial measurements: Condylobasal length of skull 32.3; zygomatic breadth 18.7; least interorbital breadth 3.5; mastoidal breadth 14.3; length of incisive foramina 6.1; alveolar length of upper molar toothrow 7.4; length of nasals 8.8; interparietal breadth 7.8; interparietal length 3.8.

Comparisons: M. o. popofensis differs from *M. o. operarius* in larger size, and in having blunter, more rounded and inflated auditory bullae.

It differs from *M. o. unalascensis* as follows: Paler coloration; larger size; auditory bullae smaller and less inflated; incisive foramina more open anteriorly.

Specimens examined: 23, from Alaska, as follows: Popof Island, 11; Unga Island, 12.

Microtus oeconomus elymocetes Osgood

Microtus elymocetes Osgood, Proc. Biol. Soc. Wash., 19: 71, 1 May 1906.

M[*icrotus*] *oec*[*onomus*] *elymocetes*, Zimmermann, Arch. f. Naturgesch., 11: 188, 10 September 1942.

Type: No. 137323, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on the east side of Montague Island, Prince William Sound, Alaska, on 12 May 1905, by C. Sheldon, original number 8(5448-X).

Distribution: Montague Island, Alaska.

Coloration: Most nearly approaches *M. o. yakutatensis* in summer pelage. The underparts are considerably suffused with buff, and are darker than in *M. o. operarius.*

Molar tooth pattern: Lower m_1 as in *M. o. operarius,* with four enclosed triangles. Three enclosed loops or triangles on m^3, five of the specimens examined having three inner and four outer salient angles, and two specimens having four inner and four outer salient angles.

Measurements: The type specimen and three adult males measure as follows: Condylobasal length of skull 31.7 (31.2–32.7); zygomatic breadth 17.9 (17.2–18.6); least interorbital breadth 3.8 (3.6–4.0); mastoidal breadth 13.4 (13.0–13.7); length of incisive foramina 5.7 (5.4–5.8); alveolar length of upper molar toothrow 7.2 (7.1–7.3); length of nasals 8.5 (8.1–9.2); interparietal breadth 6.9 (6.3–7.4); interparietal length 3.8 (3.2–4.4).

The external measurements for the series in the collections of the U. S. National Museum could not be located. Osgood (1906), however, gives external measurements for the type and two topotypes as follows: Total length 201, 191, 180; tail 40, 40, 35; hind foot (dry) 23.5, 23, 22.

Comparisons: From *M. o. operarius, M. o. elymocetes* differs in being larger and darker.

It is similar to *M. o. yakutatensis,* from which it may be distinguished by its larger size.

Remarks: Heller (1910: 342–343) found this vole abundant on Montague Island. He estimated that there was perhaps not a square rod of ground on the island without its runways. The largest specimen he collected exceeds considerably in size any of Osgood's material. His largest specimen, an adult female, measures: Total length 255; tail 49, hind foot 24.

Heller says that this island form is easily distinguished from any other form inhabiting the region by its larger size and darker coloration, the buffy wash on the underparts being heavier than in allied forms.

Specimens examined: 7, from the type locality.

Microtus oeconomus sitkensis Merriam

Microtus sitkensis Merriam, Proc. Biol. Soc. Wash., 11: 221, 15 July 1897.

M[icrotus] oec[onomus] sitkensis, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 73839, U. S. National Museum (Biological Survey Collection); immature ♂, skin and skull, collected at Sitka, Alaska, on 3 August 1895, by C. P. Streator, original number 4745.

Distribution: Baranof and Chichagof Islands.

Coloration: Similar in summer pelage to *M. o. yakutatensis.*

Molar tooth pattern: Usually five closed triangles on m_1 instead of four; m^3 has three closed triangles and generally four inner and four outer salient angles.

Measurements: An adult female from Sitka measures as follows: Total length 190; tail 45; hind foot 22; condylobasal length of skull 29.2; zygomatic breadth 16.0; least interorbital breadth 3.9; mastoidal breadth 12.4; length of incisive foramina 5.4; alveolar length of upper molar toothrow 7.2; length of nasals 7.7; interparietal breadth 7.2; interparietal length 3.7.

An adult male from Mud Bay, Chichagof Island, measures as follows: Total length 190; tail 43; hind foot 21; condylobasal length of skull 31.7; zygomatic breadth 18.2; least interorbital breadth 4.3; mastoidal breadth 13.7; length of incisive foramina 6.2; alveolar length of upper molar toothrow 7.2; length of nasals 8.7; interparietal breadth 6.9; interparietal length 4.0.

Comparisons: This subspecies closely resembles *M. o. yakutatensis*, both cranially and in coloration. It is larger, however, and has longer, narrower incisive foramina, and usually an extra closed triangle on m_1.

It differs from *M. o. operarius* and *M. o. macfarlani* in being larger in size and darker in coloration, as well as in having the extra closed triangle on m_1.

Specimens examined: 3, from Alaska, as follows: Mud Bay, Chichagof Island, 1; Sitka, 2.

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NOTES ON SOME TOAD BUGS (HEMIPTERA: GELASTOCORIDAE) FROM INDIA

By E. L. Todd
Falls Church, Virginia

A small collection of gelastocorids from the Darjiling district of India was recently sent to me by A. P. Kapur, Assistant Director of the Zoological Survey of India for identification. While only two species are represented, the information garnered through the study of the material increases our knowledge in several respects.

Nerthra asiatica (Horvath)

Mononyx asiaticus Horvath, 1892, Természetrajzi Füzetek, 15, pt. 3: 136. —Oshanin, 1909, Verzeichnis der Palaearktischen Hemipteren, vol. 1, p. 956; 1912, Katalog der paläarktischen Hemipteren, p. 89.—Kiritshenko, 1926, Konowia (Zeitsch. syst. Insekt. Mitwirk. fuhr. Ent.), 5(3): 226; 1930, Ann. Mus. Zool. Acad. Sci. URSS, p. 435.—Hoffmann, 1933, Lingnan Sci. Journ., 12, Suppl., p. 250.—Wu, Catalogus Insectorum Sinensium, 2: 559.—Hoffmann, 1941, Lingnan Sci. Journ., 20(1): 44.

Nerthra asiatica (Horvath).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 410, Pl. 14, Fig. 128; 1957, Proc. Ent. Soc. Washington, 59(4): 154.

Mononyx grossus Montandon, 1899, Bull. Soc. Sci. Bucarest-Roumanie, 8(4/5): 398.—Distant, 1906, Fauna British India, 3: 16.

One ♀ specimen from Sureil, 5000 ft, Darjiling district, India, 11–31 October 1917, N. A. & F. G. This is the first specimen I have examined from India, but the species has been previously reported from there. This specimen is smaller than those previously examined. The range in size may now be stated as follows. Female: Length, 11.0 to 12.2 mm; width of pronotum, 8.0 to 8.1 mm; width of abdomen, 8.0 to 8.5 mm. I have not seen a male of this species. Accordingly, the male genitalia have not been illustrated.

Nerthra indica (Atkinson)

Mononyx indicus Atkinson, 1888, Jour. Asiatic Soc. Bengal, 57, pt. 2: 345.—Montandon, 1899, Bull. Soc. Sci. Bucarest-Roumanie, 8(4/5):

397.—Distant, 1906, Fauna British India, 3: 15.—Paiva, 1919, Rec. Indian Mus., 16, pt. 5(23): 372.

Nerthra indica (Atkinson).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 405, Pl. 11, Fig. 98; 1957, Proc. Ent. Soc. Washington, 59(4): 152.

Mononyx projectus Distant, 1906, Fauna British India, 3: 15, Fig. 174.

Mononyx turgidulus Distant, 1906, Fauna British India, 5: 311, Fig. 175. [New synonomy.]

Nerthra turgidula (Distant).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 406.

Thirteen specimens (5♂♂, 7♀♀ and 1 nymph), all but two from the Carmichael Collection from the following localities in the Darjiling district complete the collection. Ghumti, 1500–5000 ft, June 1914; Sureil, 5000 ft, 11–31 October 1917, N. A. & F. G.; Soom, 4000–5000 ft, 8 July 1914; Singla, 1500 ft, June 1913; Sukna, 1000 ft, May 1913 and Kalimpong, 600–4500 ft.

The study of these specimens requires modifications in previous statements of size range. Male: Length, 8.2 to 9.1 mm; width of pronotum, 5.5 to 6.7 mm; width of abdomen, 5.7 to 6.4 mm. Female: Length, 8.5 to 10.2 mm; width of pronotum, 6.4 to 7.8 mm; width of abdomen, 6.4 to 8.0 mm.

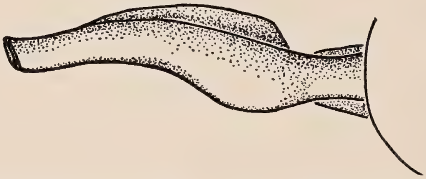

Fig. 1. Right paramere, ventral view of *Nerthra indica* (Atkinson).

The specimens under consideration verify the fact that both sexes are extremely variable in the relative widths of the pronotum and abdomen. In some instances the pronotum is wider, in others the abdomen is the wider. Correspondingly, the width of the connexivum is also variable. The species is also variable in the shape of the lateral margin of the pronotum, but those presently studied have that part less irregular in shape than in those specimens previously studied and in a few instances the specimens from the Darjiling area agree with the illustration of *Mononyx turgidulus* Distant in the shape of the margin. Therefore, I have placed that name in the synonomy of *indica*.

Because my illustration (Todd, 1955, *loc. cit.*, Fig. 98) of the entire right paramere of the male represents a different aspect than that observed when the specimen is relaxed and the paramere directed to the venter, it has been necessary to refigure (Fig. 1) the apical part of the paramere in the latter position.

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TWO NEW SPECIES OF *CINARA* FROM CALIFORNIA (APHIDAE) WHICH HAVE *PINUS COULTERI* AS HOST

By F. C. Hottes

The new species described herewith were sent me for determination by R. C. Dickson and it is a pleasure to acknowledge his assistance.

Cinara diabola, new species

Alate viviparous female: The heads of the two alate specimens have been removed so that the body length of 2.89 mm is only approximate for the holotype. Color notes from living specimens are not available. The specimen has been cleared and stained but shows the following color: Head and thorax dark dusky brown, with the median transverse suture much darker; first and second antennal segments concolorous with head, or with the second segment slightly lighter; third antennal segment with apical half dusky; fourth and fifth antennal segments dusky with apical regions slightly darker; sixth antennal segment dusky; thoracic lobes dusky brown with the margins much darker. Lateral lobes with a few scattered hairs which are short. The median portion of these lobes free from hairs. Posterior lobe of thorax with a few very short hairs in the lateral posterior region. Costal margin of forewing dusky. All femora dusky brown with the basal portion not so dark. Metathoracic femora darkest. Pro- and mesothoracic tibiae with a short basal region dark brown, this followed by light dusky which shades to dark dusky before middle. Metathoracic tibiae with short basal region dark brown, this followed by pale dusky for about one-third the length of the tibiae, remainder of tibiae dark dusky brown. Tarsal segments brown. Median region of dorsum of abdomen with six rows of wax pore plates, the two median plates being much smaller. Cornicles dusky. Transverse pigmented area anterior to cauda not divided and very wide. Cauda and anal plate brown.

Head and thorax. Antennal segments with the following lengths: III, .45 mm; IV, .16 mm; V, .22 mm; VI, .13 + .06 mm. The hairs on antennal segment three vary from .03–.045 mm in length; they are not numerous, nor are they set at the same angle, but most are at an angle of more than 45 degrees. Secondary sensoria on antennal segment three on morphotype seven, on paratype three, each with primary sensorium. The secondary sensoria are small, tuburculate and arranged in a straight row. The fourth antennal segment of the holotype varies: one antenna has a small tuberculate sensorium, the other antenna is without this. Fifth antennal segment with one secondary sensorium and the primary sensorium. Marginal sensoria on sixth antennal segment small. Last three segments of the rostrum with the following lengths: .22, .25, and .12 mm. Media of forewings once branched. Metathoracic femora .915 mm in length. Metathoracic tibiae 1.56 mm. Hairs on outer margin metathoracic tibiae comparatively few, set almost at right angles, varying in length from .045–.08 mm, spaced for the most part not much closer than their length. Hairs on inner margin of hind tibiae more numerous than those on outer margin, not so upstanding. First metatarsal segment .12 mm long, ventral surface with nine hairs; second metatarsal segment .25 mm long.

Abdomen. Hairs on dorsum of abdomen shorter than width of pigmented area from which they arise. Cornicles with base measuring about .14 mm; cornicles about as high as width of base with rim reflexed. Hairs on cornicles about .05 mm in length and few. Base of cornicles with a few concentric rows of figures made by reticulations on the surface. Hairs on pigmented area anterior to cauda few, confined largely to the ends, rather spinelike, varying as to length but none very long. Genital plate large, with a wide notch in the anterior margin, posterior margin with a concave area. Ventral surface of abdomen with numerous long (.045 mm) hairs which are spinelike. The ventral surface of the abdomen has transverse rows of coarse setulae.

Apterous viviparous female: Length from vertex to end of cauda 3.38 mm. Width of head through the eyes .74 mm. Color notes from life not available but as indicated by cleared, stained specimens as follows: Head dark brown with margins of head darker; antennae dusky brown with the sixth segment darkest; femora dusky brown; tibiae dusky brown, almost uniform in color; dorsum of abdomen with a large dusky saddle, area of dorsum not covered by saddle, pale; cornicles brown, distinct from saddle. Length of antennal segments as follows: III, .50 mm; IV, .16 mm; V, .19 mm; VI, .15 + .09 mm. Third and fourth antennal segments without sensoria; fifth segment with only secondary sensorium. Hairs on antennal segments not numerous; on third .03–.04 mm in length, longer and more numerous on anterior margin, where they are set at an angle of about 90 degrees. Ocular tubercles very small. Rostrum reaching beyond cornicles, and in paratype to genital plate. Last three segments of rostrum with the following length: III, .26; IV, .30, and V, .15 mm. Third segment of rostrum with numerous hairs along the lateral margins. Hairs along the outer margin of the prothoracic tibiae spaced about as far apart as their length, rather spinelike, set at angle slightly less than 90 degrees. Hairs on outer margin of metathoracic tibiae .05 mm in length, spaced about as far apart as their length, set at angle of about 90 degrees, not more numerous towards the apex. Saddle on dorsum with hairs sparse, not much longer than width of pale area from which they arise. Saddle with a broad, irregular depression in mid-anterior region. Base of cornicles .15 mm, slightly larger in paratype, rather high, with rim reflexed. Genital plate large. Pigmented band anterior to cauda very wide. Ventral surface of abdomen with transverse rows of setulae, and a few sharp pointed hairs which are about .045 mm in length.

Remarks: There is no question about this species being closely allied to *C. glabra* Gillette and Palmer. It may be keyed to that species in Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region. It differs from *glabra* as follows: fewer coarser, more upstanding hairs on the tibiae; a wide depression, not a deep notch in the anterior margin of the saddle; tibiae not with apical portions darker.

Holotype apterous viviparous female, morphotype alate viviparous female, on same slide as holotype of *C. montanesa.* Holotype on slide with one apterous viviparous female. Both types deposited in U. S. National Museum. Host, *Pinus coulteri* (Pitch Pine). Collected by R. C. Dickson, San Bernardino Mts., 9 August 1939.

Cinara montanesa, new species

Apterous viviparous female: Length from vertex to end of anal plate 5.70 mm. Width of head through the eyes .75 mm. Specimens of this species have been cleared, stained and mounted, there are no color notes from living specimens. Color indicated by mounted specimens as follows: Head and thorax light dusky; first and second antennal segments concolorous with head; antennal segments three, four and five with apical regions dusky, remainder of segment pale; antennal segment six uniformly dusky; femora dusky; tibiae with a very short region near base very dark dusky brown followed by a pale region which is about .75 mm in length, remainder of tibiae dusky brown; tarsal segments brown. Cornicles pale brown with clear areas; outer margin of cornicles very much broken and irregular; transverse pigmented areas anterior to cauda with a row of long and pointed hairs along the posterior margin.

Head and thorax. Antennal segments with the following lengths: III, .60 mm; IV, .30 mm; V, .31 mm; VI, .15 + .05 mm. Hair on antennal segments set at an angle of 45 degrees or more. Third antennal segment without primary sensorium. The single sensorium present on one antenna is small and more like a secondary sensorium than it is to a primary; it is also rather far removed from the end. The fourth antennal segment is like that of the third as to sensoria. The fifth antennal segment has a large primary sensorium and one secondary sensorium. The marginal sensoria on the sixth segment are small and arranged in a row. The rostrum reaches well beyond the cornicles; the last three segments measure .26, .24 and .10 mm. The mesosternal tubercle is well developed; it is more or less truncate in shape and about as long as wide at the base. The metathoracic femora are 1.66 mm in length. The metathoracic tibiae are 2.15 mm in length. The hairs on the metathoracic tibiae are fairly numerous, similar on the outer and inner margins, and quite evenly distributed. The hairs are set at an angle of about 45 degrees and are .05 mm in length. The hairs on the ventral surface of the first metatarsal segment number about eighteen; this segment is .13 mm in length. The second metatarsal segment is .33 mm in length.

Abdomen. The hairs on the dorsal surface of the abdomen vary from those that are shorter than the width of the pigmented area from which they arise to those that are .06 mm in length. On this surface both types of hair are sparse, but the longer hairs are by far the fewest, and confined largely to the anterior end of the abdomen. The hairs on the ventral surface of the abdomen are about .07 mm in length and are numerous. The dorsal surface of the abdomen is reticulated. The posterior ventral surface has very poorly developed setulae arranged in transverse rows. The outer margin of the cornicles is very irregular. Hairs on cornicles few, about .08 mm in length, except for the hairs near the margin which are somewhat thicker and very short. Genital plate with median posterior region concave.

Alate viviparous female: Length from vertex to end of cauda 3.52 mm. Color much the same as apterous viviparous female. Length of antennal segments as follows: III, .55 mm; IV, .24 mm; V, .28 mm; VI, .5 + .05 mm. The third antennal segment has six secondary sensoria plus the primary. Hairs on third antennal segment not numerous; about .05 mm in length set at an angle of slightly more than 45 degrees. The media of one wing is twice branched; the other media is only once branched. Lateral lobes of thorax with fairly numerous hairs. Median posterior lobe of thorax with a few hairs on posterior margin and a few hairs scattered over the surface. Prothoracic tibiae 1.50 mm long. Hairs on outer margin of this segment fewer than those on the inner margin and spaced further apart than their length. Length of metathoracic femora 1.53 mm. Length of metathoracic tibiae 2.92 mm. Hairs on metathoracic tibiae numerous, not procumbent, set at angle of about 45 degrees, about .05 mm in length. On the outer margin of this segment the hairs are hardly more numerous towards the apex and not set at a lesser angle. Hairs on ventral surface of second metatarsal segment much more numerous than the hairs on the dorsal surface. Cornicles across outer margin measuring .37 mm. The outer margin is much more regular than the margin in the apterous form. The hairs on the cornicles are more numerous than the hairs on the cornicles of the apterous form, but are confined largely to the restricted area. The hairs near the margin are not short nor are they thick. The hairs on the dorsal surface of the abdomen are .03 mm in length; they are extremely sparse. The hairs on the ventral surface of the abdomen are very numerous and vary in length from .04–.06 mm.

Remarks: In Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region, this species presents difficulties, and cannot be keyed without question. The cornicles bear both long and short hairs (couplet 4) but the short hairs might be overlooked. If noted, it does not become

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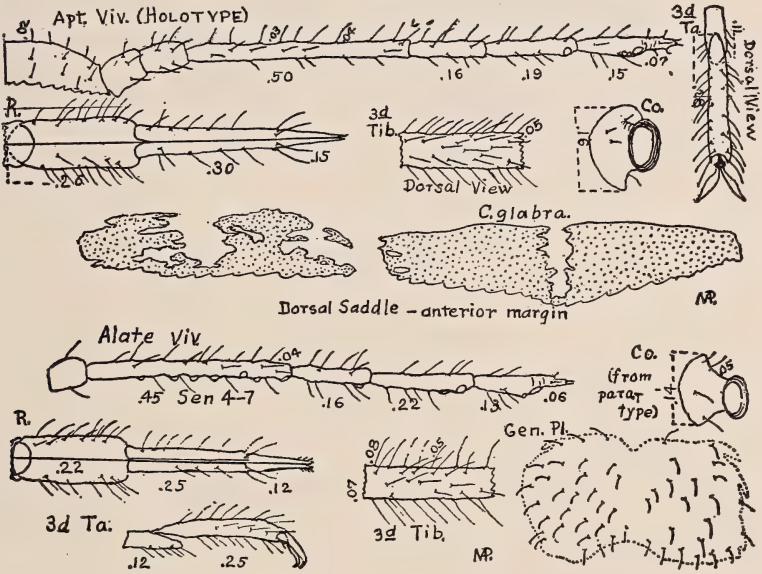
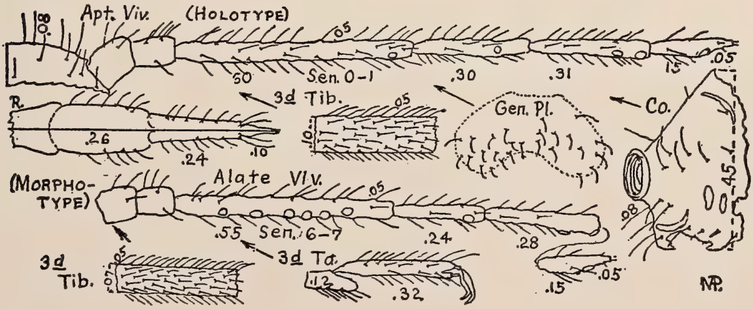
C. solitaria because the hairs on the cornicles are too few, and the hairs on the tibiae too short and fine. It is not *C. osborni* Knowlton because the cornicles have too few hairs and they are too fine and short, and the hairs on the abdomen too few and not of the correct type. If the cornicles are looked upon as having only one type of hairs as to length this species may be keyed to *C. glabra* (Gillette and Palmer) but to get to this species, the longer hairs on the anterior portion of the dorsum have to be overlooked. *C. glabra* in the apterous form has a large dorsal pigmented


Apt. Viv. (HOLOTYPE)
3d Ta.
Dorsal View
.50
.16
.19
.15
.07
R.
.30
.15
3d Tib.
Dorsal View
.05
Co.
C. glabra.
Dorsal Saddle – anterior margin
MP.
Alate Viv.
.04
.45 Sen 4-7
.16
.22
.13
.06
Co.
(from paratype)
.14
.05
R.
.22
.25
.12
Gen. Pl.
.08
.05
.07
3d Tib.
3d Ta.
.12
.25
MP.

CINARA DIABLA


Apt. Viv. (HOLOTYPE)
.08
.05
.50
Sen. 0-1
.30
.31
.15
.05
3d Tib.
.05
.10
Gen. Pl.
Co.
R.
.26
.24
.10
(MORPHOTYPE)
Alate Viv.
.05
.55 Sen. 6-7
.24
.28
.45
.08
3d Ta.
.12
.32
3d Tib.
.05
.07
.15
.05
MP.

CINARA MONTANESA

saddle which is lacking in this species, the setulae are too poorly developed, and the cornicles too large. This species seems to be most closely allied to *C. schwarzii* (Wilson) to which it will not key unless one overlooks the short hairs on the dorsum of the abdomen. This species differs from *schwarzii* in the longer pro- and metathoracic tibiae, short hairs on the dorsum of the abdomen, fewer hairs on the metathoracic tibiae and the hairs not more numerous towards the apex, two lengths of hair on the cornicles and shorter, less spinelike hairs on the pigmented areas anterior to the cauda.

Data host, *Pinus coulteri,* San Bernardino Mts., 9 July 1939, R. C. Dickson. Holotype apterous viviparous female, morphotype alate viviparous female, mounted on same slide with one alate and two apterous specimens of the same species, and two alates (one of which is the morphotype of *C. diabla* Hottes.

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A SYNTYPE OF *PEROMYSCUS MANICULATUS NEBRASCENSIS* (COUES)

By J. Knox Jones, Jr., and B. Mursaloğlu

The name *Peromyscus maniculatus nebrascensis* was originally proposed by Elliot Coues (*in* Coues and Allen, Bull. U. S. Geol. Surv. Territories, 11:79, 1877) in synonymy under *Hesperomys leucopus sonoriensis* as "*Hesperomys sonoriensis* var. *nebrascensis*." Coues credited the name to Baird, but the latter employed it as a nomen nudum, and *nebrascensis* has since been credited to Coues (see Jones, Proc. Biol. Soc. Washington, 71: 107–111, 1958, for a review of the history), although he obviously did not intend his usage of the name as an original description. Subsequent revisers designated "Deer Creek, Nebr." [= Wyoming], from which Coues (*op. cit.*: 80) listed two specimens (U. S. National Museum nos. 4310–11), as the type locality of *nebrascensis,* thereby establishing the two specimens from Deer Creek as syntypes. One of us (Jones) searched unsuccessfully several years ago in the collections of the U. S. National Museum for the specimens concerned and concluded that they probably were no longer in existence (*op. cit.*: 109). Subsequently, one of the specimens from Deer Creek was discovered among the contents of a routine loan of "Nebraskan" mammals from the Museum of Comparative Zoology at Harvard, and it is this specimen that is here discussed.

The specimen (now MCZ 5528) has four different labels attached to the left hind leg. One, a faded blue label that appears to be the original, bears printed across the top, "Expl. head waters, Missouri, Yellowstone. Capt. Raynolds, U.S.A.," and in the lower right hand corner, "Dr. F. V. Hayden." Handwritten in ink between the two is "Deer Creek January 19th 1860." The back of the label bears two numbers, "7" and "80." The latter is the original field number of the specimen, but we do not know the significance of the other. A second label bears essentially the same printed information as the first, along with "Deer Creek, Nebraska," printed in the lower left hand corner. This label also bears the date, the original number, 80, and the U.S. National Museum number, 4310. The third is the regular MCZ specimen label and the fourth simply repeats the MCZ number, 5528.

The skin was well prepared and, considering its age, is in excellent condition; no external measurements are listed, nor is the sex indicated. The skull is broken and some parts are missing. The anterior portion is fairly complete except that the lateral anterior margin of the right nasal is missing as are the anterior portions of the left nasal and premaxillary. Both zygoma are missing save for a part of the maxillary and squamosal arms on each side. The entire portion of the skull posterior to the parietals dorsally, posterior to the squamosal arms of the zygoma laterally, and posterior to about midway along the mesopterygoid fossa ventrally is missing, save for a disassociated piece of the basioccipital. Each ramus is incomplete, but the left one lacks only the angular process. The teeth

TABLE 1. Cranial measurements of the syntype of *Peromyscus maniculatus nebrascensis,* and of recently acquired specimens of the subspecies *P. m. nebrascensis* and *P. m. luteus.*

CATALOGUE NUMBER OR NUMBER OF SPECIMENS AVERAGED, AND SEX	OCCIPITONASAL LENGTH	LENGTH OF NASALS	ZYGOMATIC BREADTH	LEAST INTERORBITAL CONSTRICTION	LENGTH OF ROSTRUM	LENGTH OF INCISIVE FORAMINA	DEPTH OF SKULL	ALVEOLAR LENGTH OF MAXILLARY TOOTH-ROW
Peromyscus maniculatus nebrascensis, syntype								
MCZ 5528, ?	—	10.5	—	3.9	9.8	5.3	—	3.8
Converse and Natrona counties, Wyoming								
Average 10 (5♂, 5♀)	25.6*	10.6	13.4	4.1*	10.1	5.5	9.2*	3.9
Minimum	24.8	10.1	12.8	4.0	9.6	5.1	9.0	3.6
Maximum	26.9	11.2	13.6	4.4	10.5	5.8	9.7	4.2
Sioux County, Nebraska								
Average 25 (15♂,10♀)	25.6	10.6	13.6	3.9	10.0	5.5	9.2	4.0
Minimum	24.3	10.2	13.0	3.7	9.3	5.1	8.6	3.6
Maximum	26.5	11.5	14.3	4.3	10.3	5.9	9.9	4.3
Peromyscus maniculatus luteus, Cherry County, Nebraska								
Average 20 (11♂,9♀)	24.5	9.9	13.3	4.0	9.4	5.2	9.0	3.8
Minimum	23.3	9.5	12.6	3.7	8.9	4.8	8.8	3.6
Maximum	25.5	10.8	13.7	4.2	10.1	4.6	9.3	4.3

* 9 specimens

show moderate wear. A label in the vial with the skull bears the notation "from Boston Soc. Nat. Hist.," indicating that the specimen was deposited in that collection prior to its acquisition by the Museum of Comparative Zoology.

Osgood (N. Amer. Fauna, 28:79, 1909), who did not recognize Coues' description as valid (but instead regarded *nebrascensis* of Coues as a nomen nudum), assigned one of the two original specimens from Deer Creek (possibly the one here under discussion) to his *Peromyscus maniculatus luteus,* with geographic distribution on the Sand Hills of Nebraska and adjacent areas to the east of the range of *P. m. nebrascensis.* The dorsum of MCZ 5528 is tawny ochraceous differing from the buffy gray color of typical *nebrascensis,* but differing also from the ochraceous buff color of *luteus.* We cannot explain with certainty the difference in color between the syntype of *nebrascensis* and specimens taken in recent years from the vicinity of the type locality, but probably it relates to post-mortem changes in color ("foxing"). It should be noted, however, that populations of *P. m. nebrascensis* from mountainous areas in southern Wyoming average slightly more reddish dorsally than populations from adjacent arid plains. The place on Deer Creek from which the syntypes came lies only approximately 20 miles northeastward from the Laramie Mountains, where slightly reddish-colored specimens of *nebrascensis* have been obtained, and it is conceivable that the syntype reflects relationship with the nearby montane populations of the subspecies. The measurable cranial dimensions of the skull of MCZ 5528 (Table 1) are slightly smaller than the average for *nebrascensis,* but are well within the range of variation found in that subspecies.

In summary, the two specimens from Deer Creek, Wyoming, the restricted type locality of *Peromyscus maniculatus nebrascensis,* that were listed by Coues (*loc. cit.*) were previously thought to be no longer in existence. One of these specimens (formerly USNM 4310, now MCZ 5528) has been found. It differs from specimens of *P. m. nebrascensis* taken in recent years in being more reddish dorsally, probably owing to post-mortem changes in color; available cranial measurements, however, provide no basis for doubting its origin or identity.

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A NEW CATFISH, *CORYDORAS CONCOLOR* (CALLICHTHYIDAE) FROM VENEZUELA

By Stanley H. Weitzman
Department of Anatomy, School of Medicine,
Stanford University, California

In a collection of *Corydoras* sent to me for identification by Franz Weibezahn of the Universidad Central de Venezuela were six large, deep bodied specimens of an unknown species from the Río Parguaza, Venezuela. Another new species, *Corydoras habrosus* Weitzman (1960a), from this collection has already been described. The remainder of the species in this collection of Venezuelan *Corydoras* appears to belong to known species and will be treated in subsequent papers. The present contribution is part of a series of papers on the genus *Corydoras*, the purpose of which is to illustrate and describe every available species of the genus. References to other papers in this series may be found in Weitzman (1960a and b). I wish to thank Franz Weibezahn for the gift of the specimens, George S. Myers for use of the facilities and specimens of the Natural History Museum, Stanford University and W. I. Follett, Curator of Fishes at the California Academy of Sciences, San Francisco for loan of specimens.

Corydoras concolor, new species

Figs. 1 and 2

Holotype: Stanford University 54131, 43.8 mm in standard length, collected 17 February 1946 by Agustin Fernandez-Yepez at Las Mangas, in a tributary to the Río Parguaza, western part of the State of Bolivar, Venezuela. The Río Parguaza is a stream arising in the Serranía de Parguaza, flowing northwest and into the Río Orinoco almost opposite the island of El Gallo, 6°20′ N latitude and 67°10′ W longitude.

Paratypes: SU 54132, one specimen, standard length 41.5 mm, bearing same data as holotype. SU 54133, four specimens, standard length 51.8–

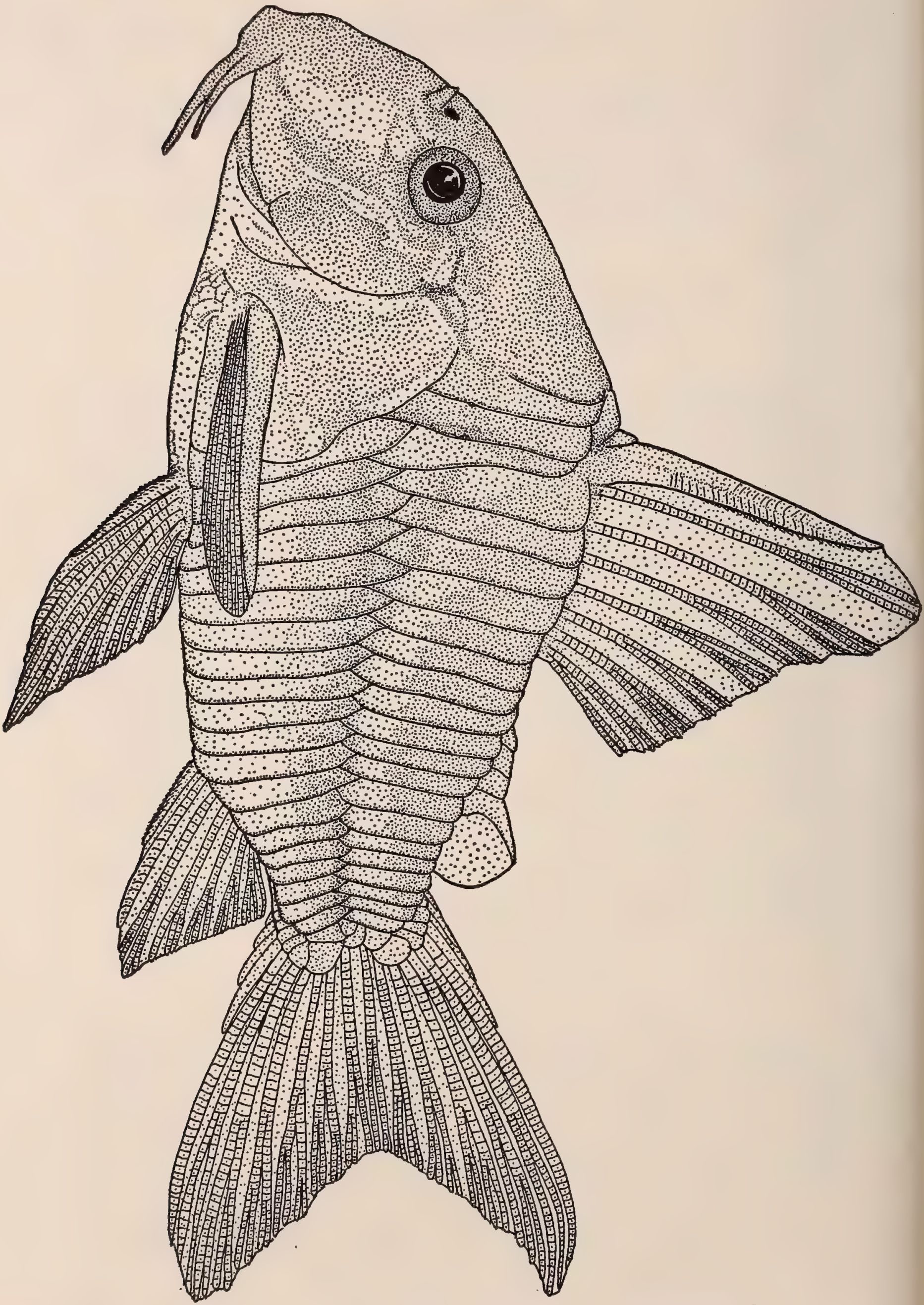

FIG. 1. *Corydoras concolor,* holotype, SU 54131. Standard length 43.8 mm.

54.2 mm, collected 7 April 1952 by Manuel Vincent Ramirez from the Río Parguaza, State of Bolivar, Venezuela.

Diagnosis: Corydoras concolor may be distinguished from other species of *Corydoras* by the following combination of characters. It lacks dark markings, has a very deep body (2.1 to 2.4 in standard length), has a large eye (3.2 to 4.0 in head length), pectoral fins incompletely surrounded by the coracoids, and a moderately high dorsal fin spine (1.1 to 1.2 in head length).

Description (holotype first, paratypes in parentheses): See Table 1 for measurements. Body relatively deep, greatest depth 2.1 (2.2–2.4). Least depth of caudal peduncle 5.9 (5.9–6.9). Dorsal fin origin nearer to snout tip than to caudal fin base. Distance between snout tip and

TABLE 1. Measurements in millimeters of specimens of *Corydoras concolor.*

MEASUREMENTS	HOLOTYPE 54131	PARATYPE 54132	PARATYPES 54133			
Standard length	43.8	41.5	51.8	52.6	54.1	54.2
Head length	14.6	13.7	17.0	16.9	17.9	17.9
Snout length	8.7	8.2	10.4	10.0	11.3	10.5
Least width of bony interorbital	7.0	6.1	7.9	7.4	7.9	7.5
Greatest diameter of bony orbit	4.2	3.4	5.1	5.2	4.7	5.0
Greatest width of suborbital	3.2	3.8	3.4	3.0	4.5	3.2
Length of fontanel	3.5	3.8	6.5	5.6	4.7	5.2
Length of predorsal scale	2.5	2.4	3.5	2.4	3.6	4.1
Greatest width of head	12.5	11.8	14.0	13.9	14.9	16.1
Snout tip to dorsal fin origin	24.0	21.8	28.9	28.3	29.1	29.5
Snout tip to adipose fin origin	37.3	34.8	45.1	44.8	46.6	46.5
Snout tip to anal fin origin	35.4	33.2	41.7	42.2	44.1	44.7
Snout tip to anterior edge of anus	24.6	22.5	27.2	27.7	29.5	27.8
Greatest body depth	20.6	18.1	22.2	22.3	23.3	24.1
Least depth of caudal peduncle	7.5	7.0	7.5	7.8	8.6	8.5
Distance between coracoids	5.4	5.1	5.3	5.5	6.2	6.7
Length of dorsal spine	13.8	12.0	15.4	14.4	15.8	14.6
Length of pectoral spine	14.9	13.0	18.2	17.5	16.8	18.3
Length of adipose spine	3.2	3.8	4.1	3.8	3.5	4.0

dorsal fin origin 1.8 (1.8–1.9). Distance between snout tip and anus 1.8 (1.8–1.9). Anal fin origin to snout tip 1.2 (1.2–1.3). Lateral scutes 23/20 (23/20 in 4 and 24/21 in one paratype). Abdomen with small granular plates, especially near the base of pelvic and pectoral fins. Azygous middorsal scutes 3 (2–4) before adipose fin and 1 before dorsal fin in all specimens. Pectoral fin base incompletely surrounded by coracoid. Area between coracoids 8.1 (8.1–10.0). Head length 3.0 (3.0–3.1); its greatest width 1.2 (1.1–1.2) in its length. Least width of bony interorbital 2.1 (2.2–2.3) in head length. Snout acute in dorsal view and snout tip slightly rounded; its length 1.7 (1.6–1.7) in head length. Dorsal profile of snout straight to slightly convex. When directed posteriorly, inferior rictal barbel reaches slightly beyond a point directly below the posterior margin of eye. Greatest diameter of orbit 3.5 (3.2–4.0) in head length. Greatest width of suborbital 1.3 (0.9–1.7) in orbit.

Dorsal fin I,7 in all specimens, last fin ray split to its base or almost to its base. In holotype first soft ray of depressed dorsal fin (but not spine) reaches adipose fin spine. Adipose fin spine 1.3 (0.9–1.4) in orbit. Anal fin i,7 in all specimens, last ray split to its base. Pectoral fin I,8 (I,8 in SU 54132; I,8 in one and I,9 in other specimens of SU 54133). Pelvic fin rays i,5 in all specimens. Caudal fin with principal rays 7/7 in all specimens. Pectoral fin spine (Fig. 2) has 28 spinules along its posterior border in the holotype, 26 in SU 54132 and 26 to 40 in specimens from SU 54133.

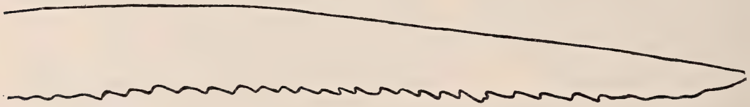

FIG. 2. *Corydoras concolor,* pectoral fin spine, ventral view, left spine.

Color: The holotype has the following color in alcohol. The over-all body color is a pale tan, slightly darker over the dorsum of the body and head. The belly and ventral region of the mouth are white. There are no dark marks of any kind over the sides of the body or head. There is, however, a faint pattern of darker tan over the body and sides of the head. This pattern is illustrated in Fig. 1. The color in life is unknown. The color of the paratypes is similar to that of the holotype.

The name *concolor* is Latin, and means uniformly colored.

Discussion: As with so many members of this genus, the relationships of this species to others are obscure. One of the most characteristic features of *Corydoras concolor* is its lack of heavy dark marks, blotches, bars or lines. In this respect it somewhat resembles some specimens of *Corydoras aeneus* (Gill 1858). However, among many other differences, the eye of *concolor* is proportionately much larger, the dorsal fin spine proportionately much longer, and the snout much less rounded. Also, most preserved specimens of *aeneus* have a large dark blotch centered about the junction of the upper and lower rows of body scutes at a vertical below the dorsal fin.

Regan (1912:218) questionably synonymized *Corydoras venezuelanus* von Ihering (1911) with *Corydoras aeneus*. Gosline (1940:19) accepted Regan's referral of *venezuelanus* without question. Whether *venezuelanus* is a synonym of *aeneus* or not is, in my opinion, uncertain, but for the present it does seem best to follow Regan and questionably refer *venezuelanus* to the synonymy of *aeneus*. In any case, comparison of *concolor* with von Ihering's very brief description of *venezuelanus* indicates that the two are not the same.

The steep, rather straight, long profile of the snout of *concolor* suggests the long snouts of such species as *Corydoras treitlii* Steindachner (1906), *acutus* (Cope 1912), *septentrionalis* Gosline (1940) and *ellisae* Gosline (1940). However, even though *concolor* appears to have a long snout it does not key to the long-snouted group in Gosline's key (1940). This is because it has a rather wide interorbital. The bony interorbital in *concolor* is contained 1.1 to 1.4 in the snout whereas in Gosline's key, the long-snouted group of *Corydoras* are stated to have the bony interorbital contained 1.7 or more times in the snout. In addition *concolor* differs from all the long-snouted *Corydoras* in color pattern. Of the *Corydoras* described subsequent to Gosline's paper (1940), *fowleri* Böhlke (1950) also has a long snout. *Corydoras concolor* differs from *fowleri* in having a different color pattern, a much deeper body and a larger eye.

If one attempts to key *concolor* in the short-snouted group of Gosline's key, the species runs to the end of the key where it matches most closely *Corydoras latus* Pearson (1924) or *Corydoras polystictus* Regan (1912). Comparison of the holotype of *latus* with that of *concolor* shows a much greater snout length in *concolor* (5.0 in standard length) than in *latus* (8.1 in standard length). Both specimens have nearly the same standard length. In addition, the dorsal spine of *latus* is proportionately shorter than that of *concolor*. The dark markings of *latus* are absent in *concolor*. *Corydoras concolor* differs from Regan's description of *polystictus* in having no dark spots on the sides of the body and dorsal fin, and in having a more acute snout in profile. Regan (1912:216) records the snout of *polystictus* as being a little longer than the diameter of the eye. In *concolor* the snout is just about twice as long as the horizontal diameter of the eye.

Corydoras concolor does not seem to be closely related to either *latus* or *polystictus* or any other short-snouted *Corydoras*. It would seem that its relationships are with the long snouted *Corydoras* but it differs from any known species of this rather artificial group to such an extent that it cannot be very closely compared with or related to any particular long-snouted species.

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S-NA-W

Vol. 74, pp. 111–118 19 May 1961

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NOTES ON AND A KEY TO SPECIES OF THE GENUS *CINARA* (APHIDAE) WHICH HAVE *TSUGA* AND *PSEUDOTSUGA* FOR HOST

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MAY 25 1961
HARVARD
UNIVERSITY

By F. C. Hottes

Once again I am indebted to Miriam A. Palmer for her generous help and the loan of material in bringing this paper to fruition.

Cinara commatula Hottes and Essig

Cinara commatula Hottes and Essig, Proc. Biol. Soc. Washington, 67: 152–153. 1954. Figs. opposite p. 153. Original description apterous and alate viviparous females.

Holotype and morphotype in Essig collection.

Were it not for the fact that Essig may be expected to have correctly determined the host of this species as *Pseudotsuga* one might question the correct determination of the host of this species, for it is the only species thus far known from *Pseudotsuga* which has the cornicles on a well-developed conical base.

Cinara dubia Hottes and Essig

Cinara dubia Hottes and Essig, Proc. Biol. Soc. Washington, 67: 156–157. 1954. Figs. p. 154 (if numbered). Original description apterous viviparous female.

Holotype in Essig collection.

I have been informed that the holotype of this species cannot at this time be located in the Essig collection. However I have seen three slides with the same data as the holotype, which were unknown to me when the species was described. They carry the determination *C. pseudotaxifoliae* Palmer. They are *C. dubia* Hottes and Essig.

As indicated in the original description, this species is closely allied to *C. pseudotaxifoliae* Palmer; however, the tibial hairs are never so numerous as in the species described by Palmer.

Cinara pseudotsugae (Wilson)

Lachnus pseudotsugae Wilson, Canadian Ent., 44: 302–303. 1912. Original description stem mother, alate male, oviparous female and alate viviparous female. These descriptions were also published in the same volume but without name on pp. 191–193.

According to Palmer the type is in the Granovsky collection.

This species is characterized by having short, coarse, spinelike hairs on the dorsum of the abdomen; and coarse, spinelike hairs which are shorter than the width of the tibiae of the apterous viviparous female. The tibial hairs are much longer in the alate.

This species is common in Colorado; I have also taken it in Arizona.

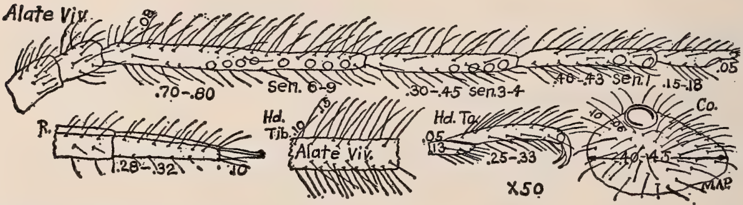
Cinara pseudotaxifoliae Palmer

Cinara pseudotaxifoliae Palmer, Aphids of the Rocky Mountain Region, pp. 42–43. 1952. Figs. Original description.

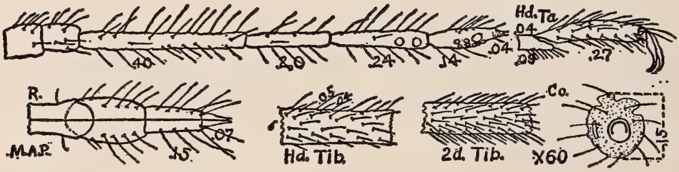
Lachnus taxifoliae Swain. Palmer, Annals Ent. Soc. America, 19: 304–307. 1926. Descriptions of all forms (misidentification).

Type in the United States National Museum.

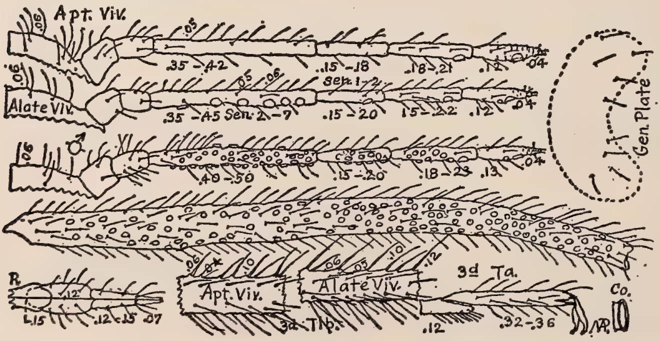
Apterous viviparous females of this species as determined by Palmer


Alate Viv.
.08
.70-.80
Sen. 6-9
.30-.45 sen.3-4
.40-.43 sen.1
.15-.18
.05
R.
.28-.32
.10
Hd. Tib.
.15
Alate Viv.
Hd. Ta.
.05
.13
.25-.33
X50
.10
.06
Co.
.40-.45
MAP.

CINARA COMMATULA H&E


.40
.20
.24
.14
.04
Hd. Ta.
.04
.08
.27
R.
MAP.
.15
.07
.05
.04
Hd. Tib.
2d. Tib.
Co.
X60
.15

CINARA DUBIA H &E


Apt. Viv.
.06
.05
.35-.42
.15-.18
.18-.21
.12
.04
.06
Alate Viv.
Sen. 1-2
.35-.45 Sen. 2-7
.15-.20
.15-.22
.12
.04
.16
♂
.40-.50
.15-.20
.18-.23
.13
.04
Gen. Plate
R.
.12
.15
.12-.15
.07
.06
.04
.10
.06
.03
.10
.12
Apt. Viv.
Alate Viv.
3d Tib.
3d Ta.
.12
.32-.36
Co.
MP.

CINARA PSEUDOTSUGAE (W)

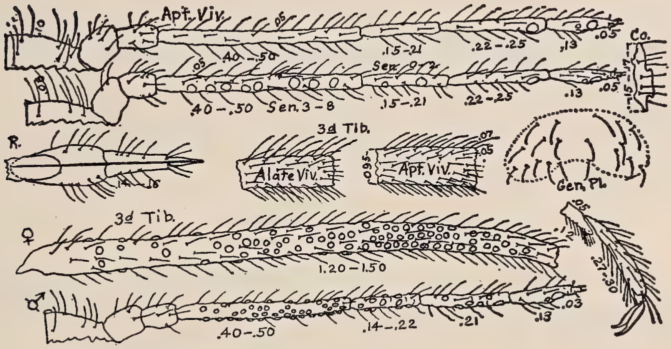
have the tibiae with two types of hairs: one most likely represented by the stem mothers or early spring generations with the hairs rather sparse and the tibiae dark; the other with the tibial hairs very numerous and more or less bunched at the apex. Palmer's figure of the tibiae (Fig. 14, Pl. XXV, Ann. Ent. Soc. America) appears to be in error.

Cinara splendens (Gillette and Palmer)

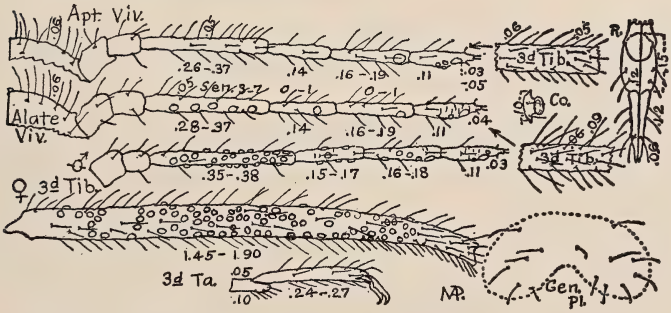
Lachnus splendens Gillette and Palmer, Ann. Ent. Soc. America, 17: 14–17. 1924. Figs. Plates V and VI. Original descriptions of all forms.

Type in U. S. National Museum.

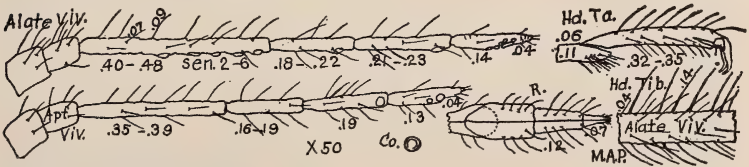
This species may be easily separated from other species of this group


Apt. Viv.
.05
.40–.50
.15–.21
.22–.25
.13
.05
Co.
.05
Sen. 0–2
.40–.50 Sen. 3–8
.15–.21
.22–.25
.13
.05
R.
.14
.16
3d Tib.
Alate Viv.
.095
Apt. Viv.
.07
.05
Gen. Pl.
♀
3d Tib.
1.20–1.50
.05
.12
.27–.30
♂
.40–.50
.14–.22
.21
.13
.03

CINARA PSEUDOTAXIFOLIAE P


Apt. Viv.
.26–.37
.14
.16–.19
.11
.03
.05
.06
.05
3d Tib.
R.
.12
.15
.12
.06
.05 Sen. 3–7
0–1
0–1
Co.
.10
Alate Viv.
.28–.37
.14
.16–.19
.11
.04
.06
.09
3d Tib.
♂
.35–.38
.15–.17
.16–.18
.11
.03
♀ 3d Tib.
1.45–1.90
3d Ta.
.05
.10
.24–.27
MP.
Gen. Pl.

CINARA SPLENDENS G & P


Alate Viv.
.07
.40–.48
Sen. 2–6
.18–.22
.21–.23
.14
.04
Hd. Ta.
.06
.11
.32–.35
Apt. Viv.
.35–.39
.16–.19
.19
.13
.04
X 50
Co.
R.
.12
.07
Hd. Tib.
.14
Alate Viv.
M.A.P.

CINARA TAXIFOLIAE (S)

which have the cornicles reduced by the fact that only the apices of the tibiae are dusky. The hairs on the dorsum of the abdomen and on the tibiae are comparatively short and spinelike.

Cinara taxifoliae (Swain)

Lachnus taxifoliae Swain, Trans. American Ent. Soc., 44: 11–14. 1918. Original description alate and apterous females. Figs. Pls. I and II.

Cinara taxifoliae (Swain), Hottes and Essig, Proc. Biol. Soc. Washington, 67: 94–95. 1954. Description of alate and apterous viviparous females. Figs. p. 96.

Specimens of this species may be easily differentiated from other species of *Cinara* with reduced cornicles, by the tibial hairs being almost at right angles and the longest hairs varying in length from .14–.15 mm in length. The dorsum of the abdomen has numerous hairs which are about .08 mm in length. On the tibiae the long hairs are intermixed with hairs which are much shorter.

Lectotype: Apterous viviparous female in the Essig collection.

Apparently this is a very rare species; I have never taken it. I have seen one slide of this species taken by Dickson in Arizona, the first recorded outside of California.

Cinara tsugae Bradley

Cinara tsugae Bradley, Canadian Ent., 92: 605–608. 1960. Figs. p. 607.

This species has for its host *Tsuga heterophylla.* I have not seen specimens. The base of the cornicles ranges from .20–.29 mm.

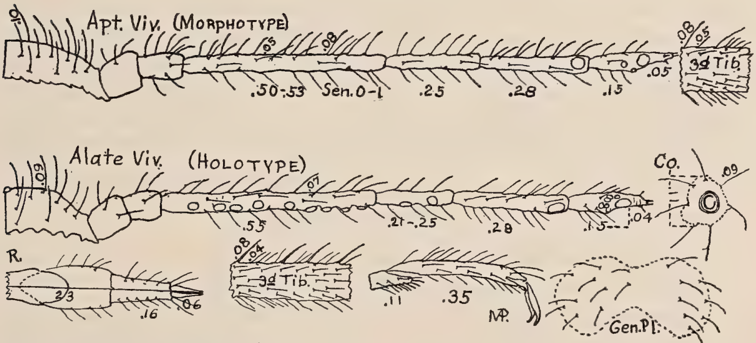
Cinara vagabunda Hottes and Essig

Cinara vagabunda Hottes and Essig, Proc. Biol. Soc. Washington, 66: 206–208. 1953. Original description alate viviparous female.

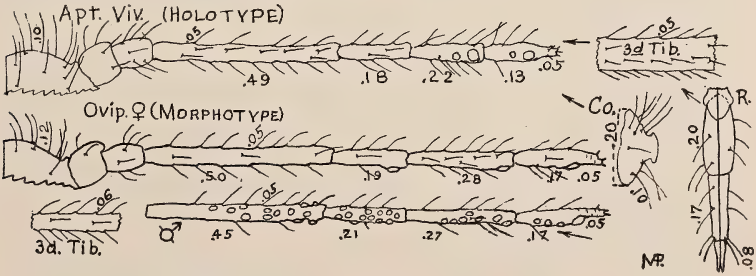
Holotype in Essig collection.

This species heretofore known only from the alate form may be easily differentiated from other species of *Cinara* by the fact that the hairs on the dorsum of the abdomen of both the alate and apterous viviparous females are longer than the hairs on the outer margin of the tibiae. In the original description the host of this species was given as *Pinus* sp., but questioned. It can now be stated that the host is *Pseudotsuga menziesii,* apterous viviparous females having been taken on this host 15 July 1954 on Mt. Graham (Graham County, Arizona).

Apterous viviparous female: Length 3.57 mm, width of head through the eyes .83 mm; length of prothoracic femora and tibiae 1.02 and 1.28 mm; length of metathoracic femora and tibiae 1.65 and 2.54 mm; length of first and second metatarsal segments .12 and .33 mm; length of antennal segments as follows: III .50 mm, IV .25 mm, V .28 mm, VI .15 + .05 mm. Color notes from life not available, as shown by cleared mounted specimen as follows: Head and thorax dark dusky brown; abdomen dark brown but not as dark as the head; cornicles dark brown, much darker than the abdomen; transverse pigmented areas very dark brown; cauda and anal plate brown; prothoracic and mesothoracic femora dark brown; metathoracic femora almost entirely black, only extreme base brown. Pro- and mesothoracic tibiae with short region near base almost black, remainder of tibiae shading from light dusky to dark dusky brown at apex; metathoracic tibiae brownish black following black basal region. Ocular tubercles small. First and second antennal segments not quite as dark as head. Third antennal segment pale dusky except for darker apex. Fourth antennal segment like third, except for darker apex. Fifth antennal segment about half dark dusky. Sixth antennal segment uniform dusky brown. Third and fourth antennal segments without sensoria. Fifth antennal segment only with primary sensorium, or with one small secondary sensorium. Apex of fifth and all of sixth antennal segments coarsely imbricated. Hairs on vertex and dorsum of head numerous, about .10 mm in length. The rostrum on the morphotype is absent, on a second apterous form segments three, four and five extend beyond the coxae of the metathoracic legs. Neither apterous form shows a mesosternal tubercle. Hairs on metathoracic tibiae rather coarse but not spinelike, on the outer margin not all of the same length, the shorter hairs being intermixed among the longer. The tibial hairs are set at an angle of about 45 degrees or slightly more, and are not more numerous towards


Apt. Viv. (Morphotype)
.50-.53
Sen. 0-1
.25
.28
.15
.05
3d Tib.
Alate Viv. (Holotype)
.09
.55
.21-.25
.28
.15
.04
Co.
R.
.23
.16
.06
3d Tib.
.11
.35
MP.
Gen. Pl.

CINARA VAGABUNDA H & E


Apt. Viv. (Holotype)
.10
.49
.18
.22
.13
.05
3d Tib.
Ovip. ♀ (Morphotype)
.12
.50
.19
.28
.17
.05
Co.
.20
R.
.20
.17
.08
3d. Tib.
♂
.45
.21
.27
.17
.05
MP.

CINARA WAHSUGAE H

the apex. Hairs on the dorsum of the abdomen varying from .07–.10 mm in length are fairly numerous. The hairs on the ventral surface of the abdomen vary from .06–.07 mm in length; they are more numerous than the hairs on the dorsum. Width of pigmented area of the cornicles about .10 mm; this area provided with a few hairs which are about .10 mm long.

Morphotype: Apterous viviparous female, mounted on a mixed slide with one other specimen of *vagabunda.* Deposited in the collection of the U. S. National Museum.

Apparently this species is most closely allied to *Cinara pseudotaxifoliae* Palmer. It differs from the species described by Palmer by having the second metatarsal segment longer, longer antennal segments in the alate, longer fourth and fifth antennal segments in the apterous form. It has longer hairs on the dorsum of the abdomen, longer femora and tibiae, and fewer coarser hairs on the tibiae.

Cinara wahsugae Hottes

Cinara wahsugae Hottes, Proc. Biol. Soc. Washington, 73: 197. 1960.

Since the description of this species was sent to press in June, Joe Schuh has sent me (November) apterous specimens of this species taken by him on *Tsuga mertensiae* in Oregon. I am led to believe that the host mentioned in the original description as *Pseudotsuga* is not correct. G. A. Bradley has sent me a reprint of his description of *Cinara tsugae.* There is no question that the two species are closely allied. I have not seen specimens of the species described by Bradley, but the species appear to differ in the total lack of a mesosternal tubercle in *wahsugae,* the tubercle not being slightly developed, the cornicles being higher, and in the oviparous female having fewer sensoria on the metathoracic tibiae.

KEY TO APTEROUS VIVIPAROUS FEMALES HAVING *PSEUDOTSUGA* AND *TSUGA* FOR HOSTS

1. Cornicles on distinct conical base 2
Cornicles not on distinct conical base 3
2. Cornicle base .40–.45 mm .... *C. commatula* Hottes and Essig
Cornicle base .15–.20 mm .... *C. wahsugae* Hottes
3. Tibiae pale except for apices .... *C. splendens* (Gillette and Palmer)
Tibiae with more than apices pigmented 4
4. Longest hairs on outer margin of metathoracic tibiae about .15 mm, set at angle of about 90 degrees .... *C. taxifoliae* (Swain)
Longest hairs on outer margin of metathoracic tibiae not longer than .12 mm, set at angle much less than 90 degrees 5
5. Hairs on dorsum of abdomen up to .105 mm in length .... *C. vagabunda* Hottes and Essig
Hairs on dorsum of abdomen much less than .105 mm 6
6. Cornicle base .20–.29 mm .... *C. tsugae* Bradley
Cornicle base about .15 mm or less 7
7. Hairs on metathoracic tibiae and dorsum of abdomen distinctly

spinelike .... *C. pseudotsugae* (Wilson)

Hairs on metathoracic tibiae and dorsum of abdomen fine, not distinctly spinelike 8

8. Almost one half of metathoracic tibiae paler than the rest, hairs on metathoracic tibiae hardly numerous .. *C. dubia* Hottes and Essig

Much less than one half of metathoracic tibiae paler than the rest, hairs on metathoracic tibiae numerous .... *C. pseudotaxifoliae* Palmer

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A NEW SUBSPECIES OF FLYING SQUIRREL (*GLAUCOMYS SABRINUS*) FROM SOUTHWESTERN UTAH

By Guy G. Musser
Grad. Res. Fellow, Dept. Zoology and Entomology,
Univ. Utah, Salt Lake City, Utah

In his *Mammals of Utah,* Durrant (Univ. Kansas Publs., Mus. Nat. Hist., 6: 151–153, 10 August 1952) referred all specimens of flying squirrels available to him from Utah to *Glaucomys sabrinus lucifugus* Hall. He studied specimens from the Uinta and Wasatch mountains in northern Utah and from the Aquarius Plateau in southern Utah. An additional record from ten miles southwest of Bryce Canyon National Park provided the extreme southwestern record of this subspecies in the state. Subsequent work by Rasmussen (Unpubl. Master's Thesis, Univ. of Utah, June, 1958) and Chamberlain (Unpubl. Master's Thesis, Univ. of Utah, March, 1958) provided specimens from the Wasatch Plateau and Fish Lake Mountains respectively, which were likewise referred to *G. s. lucifugus.* During the summer of 1960, in the course of a study of the mammalian fauna in southwestern Utah, a series of flying squirrels was obtained by the writer from the Tushar Mountains and the Pavant Range. Critical study of these specimens indicates that they are neither referable to *G. s. lucifugus,* nor to any other known subspecies, and are sufficiently distinct to warrant recognition as a new subspecies.

The writer is indebted to Seth B. Benson, Museum of Vertebrate Zoology, University of California, Berkeley, California, for the loan of comparative material and Stephen D. Durrant, Department of Zoology and Entomology, University of Utah, for his valuable suggestions and critical reading of the manuscript. The measurements of weight are in grams; all others are in millimeters. Unless otherwise indicated, all specimens are in the collections of the Museum of Zoology, University of Utah, Salt Lake City, Utah. Capitalized color terms are after Ridgway (Color Standards and Color Nomenclature, Washington, D. C., 1912).

Glaucomys sabrinus murinauralis, new subspecies

Type: Male, adult, skin and skull, no. 15652, Museum of Zoology, University of Utah; Timid Springs (SW¼ NE¼ Sec. 7, T. 29S., R. 4W.), 10,300 feet, one mile north of Big Flat Guard Station, Tushar Mountains, Beaver County, Utah; 15 August 1960; collected by Guy G. Musser; original number, 1232.

Range: Tushar Mountains and the Pavant Range in southwestern Utah, limits unknown.

Diagnosis: Based upon the type and ten paratypes (7 males, 4 females). Size: See measurements (Table 1). Color (Summer Pelage): Hairs of upper parts Sayal Brown apically, suffused with Dark Neutral Gray from basal portion; dorsal surface of gliding membrane Blackish Mouse Gray, diffused with Sayal Brown, anterior margins light gray; head lighter than body, grayer; face uniformly gray; cheeks whitish, diffusing into gray in postauricular regions; ears diagnostically Mouse Gray, cranial margins and area surrounding external auditory meatus blackish; dorsal surface of forefeet between Light Mouse Gray and Mouse Gray; dorsal surface of hind feet between Mouse Gray and Deep Mouse Gray, margined laterally with white; dorsal surface of tail between Vinaceous-Buff and Avellaneous basally, diffused with grayish-black apically, producing over-all dark Fuscous tone; apical one-third of tail darkest, being uniformly Blackish Mouse Gray, darker mid-dorsal stripe uniformly indistinct; underparts between Cinnamon-Buff and Pinkish Buff, suffused with light Neutral Gray and small areas of white; ventral anterior and posterior areas of gliding membrane Light Neutral Gray; throat Light Neutral Gray diffused with whitish-buff; ventral surface of feet grayish-buff; ventral surface of tail between Vinaceous-Buff and Avellaneous.

The pelage of the tail on the four specimens from the Pavant Range is thicker and the hairs are appreciably longer than in specimens from the Tushar Mountains.

Four juveniles in immature darker pelage possess the grayer head, gray face, Mouse Gray ears and extent of venter coloration, characteristic of this subspecies.

Skull: Nasals long, widely inflated distally, internasal suture extends caudad of frontopremaxillary suture; infraorbital foramina small; interorbital and postorbital regions narrow; braincase greatly inflated; incisive foramina short, constricted laterally so as to appear slit-like; sphenopalatine foramina large; interpterygoid space at posterior margin of palate wide, somewhat lyre-shaped; foramen ovale small; sphenopterygoid canals

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completely enclosed along entire length; roof of each alisphenoid canal incomplete for half its length.

Comparisons: The type and paratypes of *G. s. murinauralis* differ from near topotypes of *Glaucomys sabrinus lucifugus,* which it most closely resembles, as follows: Size: Total length averages longer; tail longer; ears longer. Color: Upper parts more yellowish-orange; head and face distinctly grayer; ears grayer, Mouse Gray as opposed to brown, blackish cranial margins are in contrast to dark brown of *G. s. lucifugus;* dorsolateral margins of gliding membrane markedly grayer; dorsal surface of tail uniformly grayer, lacking rufescence, particularly darker on apical one-third of tail, mid-dorsal tail stripe generally not as pronounced; dorsal surface of forefeet gray as opposed to brown; dorsal surface of hind feet Deep Mouse Gray as opposed to Hair Brown; dorsal surface of gliding membrane darker; hairs of underparts dominantly Pinkish Buff apically, with some whitish, as opposed to whitish apically, with area of Pinkish Buff generally reduced; throat uniformly grayer; ventral surface of feet grayer; ventral surface of tail less rufescent. Skull: Nasals average slightly longer and expanded slightly wider distally, internasal suture extends caudad of frontopremaxillary suture as opposed to terminating at level of frontopremaxillary suture; interorbital and postorbital breadths significantly less; braincase slightly more inflated; incisive foramina significantly shorter, narrower; sphenopalatine foramina generally larger; interpterygoid space at posterior border of palate significantly wider; foramen ovale smaller in seventy per cent of specimens studied; foramen magnum slightly smaller.

From near topotypes of *Glaucomys sabrinus bangsi* (Rhoads), the type and paratypes of *G. s. murinauralis* differs as follows: Size: Tail longer; hind foot averages shorter; ears longer; weight significantly less. Color (comparisons made with three specimens of *G. s. bangsi* in comparable pelage): Upper parts lighter, more yellowish-orange, hairs Sayal Brown in contrast to dark Wood Brown apically, hairs lighter basally; head distinctly grayer; face gray as opposed to brown; ears markedly grayer, Mouse Gray as opposed to dark brown; postauricular region whitish-gray as opposed to Avellaneous; dorsal surface of tail lighter, more yellowish-orange; dorsal surface of forefeet gray as opposed to brown; dorsal surface of hind feet Deep Mouse Gray in contrast to Clove Brown; hairs of underparts generally lighter basally, apically more Pinkish Buff than Cinnamon-Buff; ventral surface of tail grayer; ventral surface of feet gray in contrast to dark brown. Skull: Smaller in all measurements except postorbital breadth which averages slightly larger in *G. s. murinauralis*; nasals narrower; braincase markedly more vaulted; frontal process of zygoma higher, more pronounced; orbit smaller; sphenopalatine foramina markedly larger; foramen ovale smaller; sphenopterygoid canals completely enclosed throughout entire length as opposed to sphenopterygoid canals open medially throughout entire length except at anterior and posterior openings; roof of each alisphenoid canal incomplete for half its length in contrast to roof of each alisphenoid canal complete throughout entire length, terminating at anterior border of each foramen ovale; tympanic bullae smaller; foramen magnum narrower, slightly higher.

Systematic remarks: Flying squirrels of the subspecies *G. s. murinauralis* are apparently restricted to the Tushar Mountains and the Pavant Range. At the present time, only one specimen, a juvenile, is available from the Markagunt Plateau, the nearest highland to the south. Compared with juvenile specimens in comparable pelage from the Tushar Mountains, the specimen from the Markagunt Plateau is similar in the possession of the diagnostic Mouse Gray ears, gray face and head, and extent of venter coloration. The diagnostic cranial characters, however, are not well developed in juvenile specimens. In view of this fact and because subspecific determinations should be based on a larger sample of the population than one individual, subspecific assignment of the Markagunt Plateau specimen is tentatively held in abeyance until a series of adult specimens from the latter area is available. Acquisition and study of adult material from the Markagunt Plateau may show them to be referable to *G. s. murinauralis.*

G. s. murinauralis has its closest affinities both geographically and morphologically with *G. s. lucifugus,* the subspecies occupying the Uinta and Wasatch mountains and central high plateaus of Utah. Two specimens of *G. s. lucifugus* from the Fish Lake Mountains; one from Seven Mile Valley, the other from Lost Lake, demonstrate some intergradational tendencies toward *G. s. murinauralis* in both cranial and skin characters. The skulls of both specimens possess the characters of *G. s. lucifugus* except for the shorter incisive foramina and smaller foramen ovale, both characteristic of *G. s. murinauralis.* The specimen from Seven Mile Valley possesses dorsal coloration identical with that of *G. s. murinauralis,* but all other skin characters are as found in *G. s. lucifugus.*

Flying squirrels belonging to the subspecies *G. s. lucifugus* and *G. s. murinauralis* form a closely related subspecies complex which is markedly differentiated from those of *G. s. bangsi.* Study of ten near topotypes of *G. s. bangsi* from Idaho County, Idaho, reveals that although this subspecies is the closest geographic race to the two subspecies from Utah, it is markedly different morphologically, and close morphological relationships are not apparent. This is particularly well demonstrated in the cranial characters. Skulls of the animals belonging to the *lucifugus-murinauralis* complex are smaller in every measurement taken except the postorbital breadth. The greatest length of the skull is significantly longer in specimens of *G. s. bangsi.* This apparent shortening of the skull in the *lucifugus-murinauralis* group is reflected in the vertical height of the braincase, which is markedly more vaulted than in members of *G. s. bangsi.* The outstanding cranial differences, however, are in the arrangement of the sphenopterygoid and alisphenoid canals. In representatives of *G. s. bangsi,* the sphenopterygoid canals are open medially throughout their entire lengths except at the anterior and posterior openings and the roof of each alisphenoid canal is complete along its entire length, terminating at the anterior border of each foramen ovale. In those specimens of the *lucifugus- murinauralis* complex, however, the sphenopterygoid canals are completely enclosed throughout their entire lengths and the roof of each alisphenoid canal is incomplete, extending only halfway between the anterior opening of each canal and the anterior border of each formen ovale. In the series of flying squirrels studied by the writer, the cranial characters separating members of *G. s. bangsi* from those of the *lucifugus-murinauralis* complex are constant. Indeed, there was no specimen studied of each group which possessed any intergradational tendencies in the aforementioned characters. When Hall (Occ. papers Mus. Zool. Univ. Michigan, no. 296: 2, 2 November 1934) described *G. s. lucifugus,* one of the distinguishing cranial characters he found was the width of the rostrum, which expressed as a percentage in relation to the length of the nasals was less than 53 per cent of the length of the nasals. This was in contrast to *G. s. bangsi* in which the width of the rostrum was more than 53 per cent of the length of the nasals. Durrant (op. cit.: 153) referred a specimen from Wolf Creek Summit to *G. s. lucifugus,* although it suggested an intergradational tendency towards *G. s. bangsi* in that the width of the rostrum was slightly over 53 per cent of the length of the nasals. The writer has found that this percentage as a comparative value is inconsistent and unreliable. Percentages computed on the width of the rostrum to the length of the nasals on ten near topotypes of *G. s. bangsi* reveal that only two specimens exceed 53 per cent, the remainder being less than 53 per cent; on eleven near topotypes of *G. s. lucifugus,* three specimens exceed 53 per cent and eight are less; on eleven specimens of *G. s. murinauralis,* two specimens exceed 53 per cent. There is no doubt that the width of the rostrum is greater in specimens of *G. s. bangsi* than in those of the *lucifugus-murinauralis* complex, but because the nasals are also longer in the former, the percentage value as a distinguishing character is invalid.

Habitat: On the Tushar Mountains, flying squirrels were taken in Engelmann spruce (*Picea engelmanni* [Parry] Engelm.) from elevations of 7,875 feet to 10,300 feet. Those from the Pavant Range were trapped in stream-bottom stands of white fir (*Abies concolor* [Gordon and Glendinning] Hoopes) interspersed with narrowleaf cottonwood (*Populus angustifolia* James) at an elevation of 6,800 feet. On both the Tushar Mountains and Pavant Range, trapping in stands containing only cottonwoods or aspen (*Populus tremuloides* Michx.) proved unsuccessful. At 7,975 feet on the Tushar Mountains, rat snap traps were nailed to both spruce and aspen trees which existed together at this locality. A flying squirrel was taken from the spruce only. On the Pavant Range where white fir and narrowleaf cottonwoods were found in association, the former tended to be concentrated higher on the canyon slopes, the latter below and along the stream banks. Here, flying squirrels were taken in the white fir, although one individual was seen ascending a cottonwood. The largest single population of these animals observed was in Engelmann spruce at 10,300 feet on the Tushar Mountains. These data suggest that flying squirrels on these two highlands prefer a habitat in which conifers are the dominant trees. It is suspected that the source of food coupled with the rough texture of the bark on conifers are probably important factors in the selection of this habitat.

On both the Tushar Mountains and Pavant Range, flying squirrels appear to show a decided affinity for camp grounds and picnic areas when such areas are located in suitable habitat. This statement is based upon trapping results. Although suitable habitat was trapped in locations far removed from camping and picnic areas, flying squirrels were taken only at these latter areas. Open garbage pits and refuse left by campers and picnickers in coniferous areas are great attractions as a food source not only to flying squirrels but to other sciurids as well. In observing the nocturnal activity of flying squirrels (using artificial light), several were seen foraging in garbage pits, around garbage cans, and on picnic tables. One individual was seen ascending a spruce tree with a slice of bread in its mouth, while another was seen feeding on the remains of discarded corn cobs. Analyses of stomach samples from four individuals taken at a picnic area on the Tushar Mountains revealed only unidentifiable

TABLE 1.—Measurements of the Type and Paratypes of *Glaucomys sabrinus murinauralis* from the Tushar Mountains and Pavant Range

MEASUREMENT	n[a]	$\bar{x}$ ± 2 S.E.[b]	S.D.[c]	EXTREMES
Total length	12	328.8 ± 3.4	5.9	318 –338
Tail length	12	156.7 ± 3.2	5.6	148 –167
Hind foot	12	40.2 ± 1.3	2.3	34 – 43
Height of ear	12	27.5 ± 0.8	1.4	25 – 30
Weight	11	133.9 ± 3.8	6.2	126 –146
Greatest length of skull	10	40.0 ± 0.3	0.6	39.1– 40.1
Zygomatic breadth	11	24.1 ± 0.1	0.4	23.7– 24.4
Mastoid breadth	10	18.3 ± 0.1	0.1	18.0– 18.5
Interorbital breadth	11	7.4 ± 0.1	0.2	7.1– 7.7
Postorbital breadth	11	8.9 ± 0.2	0.4	8.4– 9.4
Length of nasals	11	12.5 ± 0.2	0.4	12.0– 13.5
Breadth of rostrum	11	6.4 ± 0.1	0.1	6.2– 6.5
Toothrow	11	8.2 ± 0.4	0.4	7.1– 8.6
Length of incisive foramina	11	2.2 ± 0.1	0.2	2.0– 2.6
Interpterygoid width[d]	11	3.9 ± 0.1	0.1	3.7– 4.1

[a] Size of sample.

[b] The mean and standard error of the mean.

[c] Standard deviation.

[d] Taken at posterior margin of palatines.

amorphous vegetable matter, suggestive of ingested refuse from this area.

The Tushar Mountains and Pavant Range are separated from the central high plateaus to the east by the semi-arid Sevier River Valley, and from the Markagunt Plateau to the south by intervening foothills and semi-arid valleys. At the present time, the intervening valleys serve as effective barriers in the distribution of coniferous habitat on the Tushar and Pavant highlands. The isolation of coniferous areas has in turn served as an isolating mechanism to the populations of flying squirrels on these highlands apparently dependent upon this type of habitat.

Specimens examined: Total 17, distributed as follows: MILLARD COUNTY: Pistol-Rock Picnic Area, Fillmore Canyon, 8 miles E Fillmore, 6,800 feet, Pavant Range, 1; Balsam Picnic Area, Fillmore Canyon, 8 miles E Fillmore, 6,800 feet, Pavant Range, 1; Buckskin Charley Picnic Area, Fillmore Canyon, 8 miles E Fillmore, Pavant Range, 2; BEAVER COUNTY: Indian Creek Guard Station, 9 miles E Highway 91, 7,875 feet, Tushar Mountains, 1; Kent's Lake, 8,800 feet, Tushar Mountains, 1; conifers behind M.I.A. cabin, Britts Meadow (Delano Ranger Station), 8,850 feet, Tushar Mountains, 1; Timid Springs, 1 mile N Big Flat Guard Station, 10,300 feet, Tushar Mountains, 10.

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NORTH AMERICAN MONOGENETIC TREMATODES IX. THE FAMILIES MAZOCRAEIDAE AND PLECTANOCOTYLIDAE*

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This paper is a continuation of the series dealing with the North American monogenetic trematodes and of a general revision of the Monogenea. The purpose and organization of this installment are the same as for previous sections (Price, 1937, 1938, 1939a, 1939b, 1942, 1943a, 1943b, and 1961).

The present installment deals primarily with the Mazocraeidae. The inclusion of the Plectanocotylidae is largely for convenience; it is a small group the relationships of which are not too well established. Sproston (1946) regarded it as a subfamily of the family Discocotylidae, whereas Bychowsky (1957) considered it as a family of the suborder Discocotylinea. The present writer cannot agree with either of these viewpoints, and regards Phillocotylidae as a more or less intermediate group with its greatest affinities with the Mazocraeidae of the suborder Mazocracraeinea Bychowsky.

Family Mazocraeidae Price, 1936

Synonyms: Octocotylidae Monticelli, 1888; Octobothriidae Monticelli, 1888, in part; Octobothriidae Taschenberg, 1879, in part; Hexacotylidae Monticelli, 1903; Mazocriidae Southwell and Kirshner, 1937, in part; Pleurocotylidae Monticelli, 1903; Grubeidae Poche, 1926.

Diagnosis: Body elongate to clavate. Prohaptors in form of two well-developed suckers opening into oral cavity; opisthohaptor bearing four pairs of clamps (except in *Grubea*) of a special sort; middle and ventral loop elements fused to form inverted U-shaped pieces, dorsal loop elements incomplete, and center piece more or less scoop-shaped, usually weakly cuticularized; anchors usually two to three pairs, unequal and dissimilar, outer pair larger than others, on terminal lappet. Genital aperture armed with hooks of two types, a pair of larger, outwardly directed laterals, and several pairs of smaller, medially directed inner hooks arranged in two, either transverse or vertical, rows or in a circle. Testes either follicular or as a lobed mass. Ovary U-shaped, with proximal and distal limbs directed anteriad. Vagina, when present, single and opening on mid-dorsal surface, or, rarely, Y-shaped and opening laterally.

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Type genus: Mazocraes Hermann, 1782.

This family consists of a number of more or less heterogeneous species which may be grouped into five reasonably well-defined groups; these groups are regarded as worthy of subfamily rank and may be separated by the following key:

Key to Subfamilies of Mazocraeidae

1.—Opisthohaptor asymmetrical, with four large clamps on right side and a single small clamp corresponding to most distal of large clamps on left side; inner hooks of genital corona arranged in a circle .... Grubeinae new subfamily
Opisthohaptor symmetrical, with four pairs of clamps; inner hooks of genital corona in two either transverse or vertical rows 2
2.—Inner hooks of genital corona in two transverse rows .... Mazocraeinae new subfamily
Inner hooks of genital corona in two vertical rows 3
3.—Vagina double .... Neomazocraeinae new subfamily
Vagina, if and when present, single 4
4.—Opisthohaptor embracing area of gonads, either of testes or of both ovary and testes .... Mazocraeoidinae new subfamily
Opisthohaptor terminal, not involving area of gonads 5
5.—With large ventral, sucker-like depression posterior to genital aperture; hook-bearing lappet of opisthohaptor divided into two cone-like lobes .... Clupecotylinae new subfamily
Without ventral, sucker-like depression posterior to genital aperture; hook-bearing lappet of opisthohaptor not divided .... Kuhniinae new subfamily

Mazocraeinae, new subfamily

Synonyms: Octocotylinae Braun, 1893; Octobothriidae Monticelli, 1903.

Diagnosis: Opisthohaptor terminal, more or less triangular; clamps four pairs, equal or unequal in size; anchors two or three pairs, dissimilar. Genital corona with two kinds of hooks, one pair of laterals with outwardly directed tips and several pairs of inner hooks arranged in two transverse rows, with medially directed tips. Vagina present or (?) absent, opening dorsally. Other characters as for family.

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Type genus: Mazocraes Hermann, 1782.

As presently conceived, this subfamily contains three genera, one of questionable validity, which may be separated as follows:

KEY TO GENERA OF MAZOCRAEINAE

1.—Opisthoptoral clamps not uniform, anterior pair larger than others .... *Pseudanthocotyloides* Price
Opisthohaptoral clamps uniform in size 2
2.—Opisthohaptor with terminal lappet bearing two pairs of minute suckers in addition to anchors .... *Ophicotyle* Beneden and Hesse
Opisthohaptor without suckers on terminal, hook-bearing lappet .... *Mazocraes* Hermann

Genus *Mazocraes* Hermann, 1782

Synonyms: Octobothrium Leuckart, 1827; *Octostoma* Kuhn, 1829, not Otto, 1823; *Octocotyle* Diesing, 1850; *Octoplectanum* Diesing, 1858; *Octobothrium* (*Octocotyle*) Saint-Remy, 1891; *Glossocotyle* Beneden and Hesse, 1863.[1]

Diagnosis: Opisthohaptor lobe-like, bearing four pairs of clamps of the mazocraeid type, and with terminal lappet bearing two or three pairs of dissimilar anchors, outermost or large anchors with bifid roots and recurved tips. Genital corona with two lateral large hooks and an anterior and posterior transverse row of about four hooks each. Testis deeply lobed or divided into indistinct follicles, postovarial. Ovary U-shaped, pretesticular Vitelline follicles extending into opisthohaptor. Vagina present, opening dorsally in median line posterior to intestinal bifurcation. Eggs usually with filament at each pole.

Type species: Mazocraes alosae Hermann, 1782, from *Clupea alosa, Alosa finta, Caspialosa kessleri, C. kessleri volgensis,* and *C. caspia.*

Included species: Mazocraes harengi (Beneden and Hesse, 1863) Nicoll, 1915, from *Clupea harengus; M. heterocotyle* (Beneden, 1870) Sproston, 1946 (sp. inq.), from *C. sprattus; M. pilchardi* (Beneden and Hesse, 1863) Sproston, 1946, from *C. pilchardus*; *M. tripathii* n. n., for *M. orientalis* Tripathi, 1959, not Chauhan, 1950,[2] from *Dussumiera acuta*; *M. vilelai* Tendeiro and Valdez, 1955, from "*Alosa alosa*"; and *M. gonialosae* Tripathi, 1959, from *Gonialosa manmina.*

None of the species listed above has, so far, been reported from North American hosts.

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[1] See discussion of *Mazocraes* and *Glossocotyle* by Sproston (1946).

[2] The new name *Mazocraes tripathii* is here proposed for the species described by Tripathi (1959) as *M. orientalis* Chauhan, 1950. The description and figures given by Chauhan (1950) for his *M. orientalis* are not detailed but assuming the correctness of the arrangement of the genital hooks it must be referred to the genus *Kuhnia,* and becomes *K. orientalis* (Chauhan, 1950) new combination. The species reported as *M. orientalis* Chauhan is, according to the arrangement of the genital hooks, a species of *Mazocraes* and *M. orientalis* Tripathi, not Chauhan, becomes a homonym of *M. orientalis* Chauhan (=*Kuhnia orientalis* Chauhan).

Genus *Ophicotyle* Beneden and Hesse, 1863

Diagnosis: Opisthohaptor elongate, bearing four pairs of equal clamps and with a terminal lappet provided with two pairs of minute suckers and two pairs of anchors. Genital hooks as in *Mazocraes.*

Type species: Ophicotyle fintae Beneden and Hesse, 1863, from *Alosa fintae.*

This genus is closely related to *Mazocraes* Hermann and is represented by only the type species; it is of questionable validity. The minute accessory suckers on the terminal lappet of the opisthohaptor may eventually be shown to be artifacts in which case the genus should be suppressed as a synonym of *Mazocraes.*

Genus *Pseudanthocotyloides* Price, 1959

Diagnosis: Anterior pair of opisthohaptoral clamps much larger than posterior three pairs. Vagina (?) absent. Egg with filament at posterior pole. Genital hooks and other characters as in *Mazocraes.*

Type species: Pseudanthocotyloides banghami Price, 1959.

Inasmuch as the type and only species of this genus was originally described briefly in abstract (Price, 1959), a more detailed account is given below.

Pseudanthocotyloides banghami Price, 1959

Figs. 1–6

Description: Body elongate to clavate, 1.4 to 3.5 mm long by 0.3 to 0.5 mm wide. Prohaptoral suckers circular, 0.040 to 0.060 mm in diameter. Opisthohaptor consisting of four pairs of mazocraeid clamps, occupying approximately 0.5 mm of total body length; clamps of anterior pair largest, 0.12 to 0.14, second pair 0.08 to 0.09, third pair 0.07, and fourth and most distal pair 0.06 mm in diameter, respectively; opisthohaptoral anchors two pairs, outer 0.060 to 0.068 mm long, inner pair 0.020 to 0.024 mm long, and a flask-shaped intermediate hook guard about 0.010 mm long between large and small anchors. Pharynx oval, about 0.060 mm long by 0.036 to 0.040 mm wide; esophagus about 0.45 mm long in extended specimens, heavily pigmented; intestinal branches extending into opisthohaptor to about level of distal pair of clamps, provided with short medial and longer lateral, branched, heavily pigmented diverticula. Genital aperture about 0.12 mm distal to base of pharynx; genital corona consisting of a pair of lateral hooks each about 0.014 mm long and two transverse rows of inner hooks each about 0.014 mm long; hooks of anterior transverse row four in number, staggered, those of poste-

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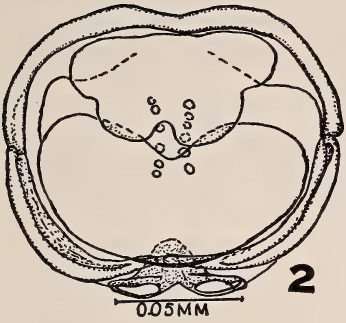
Figs. 1–6. *Pseudanthocotyloides banghami.* 1.—holotype, ventral view; 2.—opisthohaptoral clamp of anterior pair; 3.—clamp of posterior pair; 4.—opisthohaptoral anchors; 5.—genital corona; 6.—egg.

Fig. 7. *Plectanocotyle elliptica.* Complete worm, ventral view. From Diesing, 1858.



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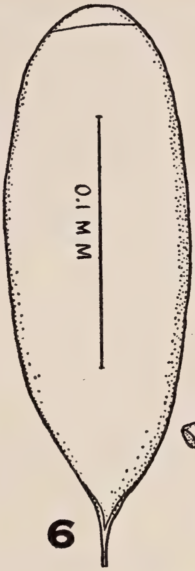

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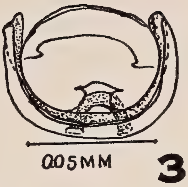

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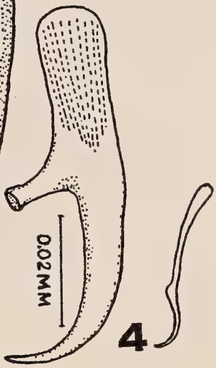

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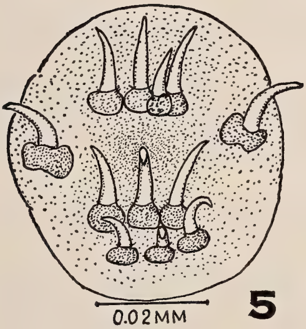

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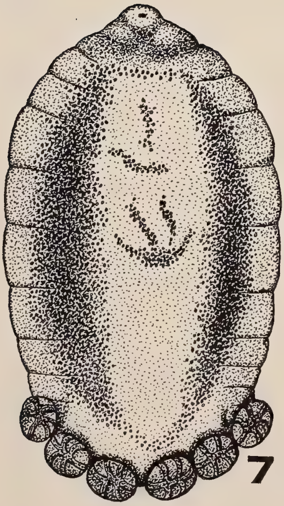

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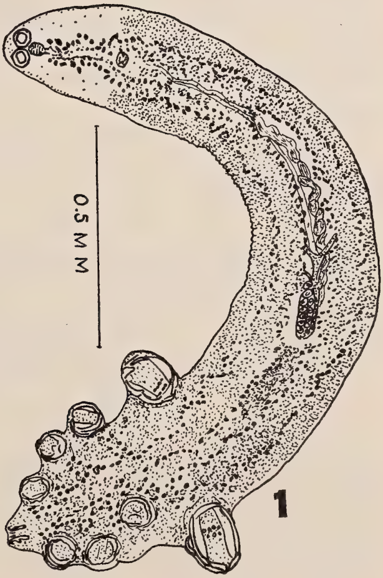

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rior row six in number, actually two alternating rows of three hooks each. Testicular arrangement not ascertainable because obscured by vitelline follicles; vas deferens convoluted, in median field. Ovary U-shaped, with left limb about twice as long as right, in equatorial zone; genito-intestinal canal opening into right intestinal branch about level of distal pole of ovary; vitelline follicles extending from about level of genital aperture to level of distal pair of opisthohaptoral clamps, obscuring greater part of internal organs. Vagina not observed. Uterus thick-walled. Egg oval, about 0.2 mm long by 0.07 mm wide, with long, slender filament at posterior pole.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot and Norris lakes, Tennessee, and Guntersville Lake, Alabama).

Specimens: USNM Helm. Coll. no. 37716 (holotype), 37717–37718 (paratypes) and 37719.

The above description is based on a study of eight specimens, as follows: five collected in 1938 at Norris Lake, Tennessee, and two collected in 1939 at Reelfoot Lake, Tennessee, by Ralph G. Bangham, and one from a gizzard shad caught in 1959 at Guntersville, Alabama, by Harold S. Strickland.

Kuhniinae, new subfamily

Diagnosis: Opisthohaptor terminal, cordate or linguiform, bearing four pairs of equal or unequal clamps of mazocraeid type and two pairs of anchors; outermost anchors relatively large. Hooks of genital corona of two types, one pair of outwardly directed laterals each arising from a reniform muscular pad, and two vertical rows of smaller inwardly directed hooks. Vagina present or (?) absent. Other characters as given for family.

Type genus: Kuhnia Sproston, 1945.

Three genera are included in this subfamily and may be separated by the following key:

KEY TO GENERA OF KUHNIINAE

1.—Genital hooks of vertical rows of two types .. *Paramazocraes* Tripathi
Genital hooks of vertical rows of one type 2
2.—Opisthohaptoral clamps of anterior pair larger than those of other pairs .... *Pseudanthocotyle* Bychowsky and Nagibina
Opisthohaptoral clamps of uniform size .... *Kuhnia* Sproston

Genus *Kuhnia* Sproston, 1945

Synonyms: Octobothrium Leuckart, 1827, in part; *Octocotyle* Diesing, 1850, in part; *Octoplectanum* Diesing, 1858, in part; *Mazocraes* Hermann, 1782, in part.

Diagnosis: Opisthohaptor cordate to linguiform, bearing four pairs of more or less equal-sized clamps of mazocraeid type, and with two, sometimes three, pairs of anchors. Median hooks of genital corona of one kind, arranged in vertical rows. Vitelline follicles rarely entering opisthohaptoral area. Vagina absent.

Type species: Kuhnia scombri (Kuhn, 1829) Sproston, 1945, from *Scomber scombrus, S. japonicus,* and *S. kanagunta.*

Included species:[3] *Kuhnia brevoortia* Hargis, 1955, from *Brevoortia partonus; K. macracantha* (Meserve, 1938) Sproston, 1946, from unidentified species of mackerel; *K. minor* (Goto, 1894) Sproston, 1946, from *Scomber japonicus* (= *S. colias*); *K. indica* Tripathi, 1959, from *Cybium guttatus; K. orientalis* (Chauhan, 1950) new combination, from *Dussumieria* sp.; *K. singaporensis* new species, from "Ikan Trubot"; *K. sprostonae* new name (synonym: *K. minor* Sproston, 1945, not Goto, 1894),[4] from *Scomber scombrus;* and *K. thunni* (Ishii, in Ishii and Sawada, 1938) Sproston, 1946 (synonym: *Dactylocotyle minor* Ishii, 1936),[5] from *Thunnus orientalis.*

In addition to a consideration of *K. scombri* and *K. brevoortia,* the only members of the genus so far reported from American hosts, a description of an apparently new exotic species is included.

Kuhnia scombri (Kuhn, 1829) Sproston, 1945

Figs. 8–14

Synonyms: Octostoma scombri Kuhn, 1929; *Octobothrium scombri* (Kuhn, 1829) Nordmann, 1832; *Octocotyle scombri* (Kuhn, 1829) Bene-

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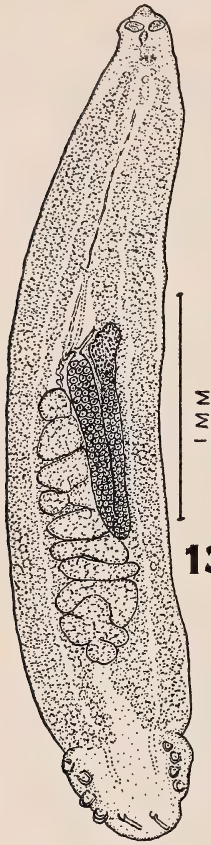
[3] *Kuhnia otolithis,* which was described by Yamaguti (1953), has been transferred by Hargis (1955) to the genus *Tagia* Sproston which he placed in the family Discocotylidae, since the type of opisthohaptoral clamps and the type and arrangement of the genital hooks eliminated it from the genus *Kuhnia.* Tripathi (1959) was in agreement with Hargis in eliminating this species from the genus *Kuhnia,* but believed that it "belongs to Diclidophoridae as suggested by its genital coronet and the asymmetrical advanced clamp structure."

Kuhnia brami (Parona and Perugia, 1896) Sproston, 1946 has been shown by Bychowsky (1957) to belong to the genus *Winkenthughesia* Price and, accordingly, is referable to the family Gastrocotylidae.

[4] *Kuhnia minor* (Goto) of Sproston (1945) which she reported from *Scomber scombrus* in the English Channel area, on the basis of shape of the large anchors, cannot be the same as the species described by Goto (1894) under that name from *Scomber colias* (= *S. japonicus*). The large anchors described and figured by Sproston for the species which she regarded as *K. minor* are "Slender and wholly solid with thin U-shaped hook and spur about midlength. The shaft is ridged." The corresponding anchors of Goto's species have short, wide shafts which are not ridged. There are also differences in the number and arrangement of the hooks of the genital corona. In view of these differences, the writer proposes for *Kuhnia minor,* Sproston, 1945 (not Goto) the name *Kuhnia sprostonae* new name.

[5] *Kuhnia thunni* (Ishii, in Ishii and Sawada, 1938) Sproston, 1946, is properly allocated to *Kuhnia* Sproston. The writer (Price, 1943) noted that "*Dactylocotyle minor* Ishii (1936) renamed *D. thunni* Ishii, in Ishii and Sawada (1938), does not belong to the genus *Dactylocotyle* (= *Diclidophora*) but is a species of *Mazocraes.*" This statement was based on an examination of a paratype specimen kindly supplied by Prof. Ishii. The specimen was not in the best of condition, but was sufficiently good to show its generic affinities. Figs. 15–18 of Ishii's specimen are included herein for comparison with other species of *Kuhnia.* The allocation of this species to *Mazocraes* was made before Sproston (1945) had established the genus *Kuhnia.*



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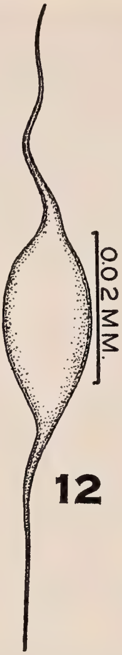

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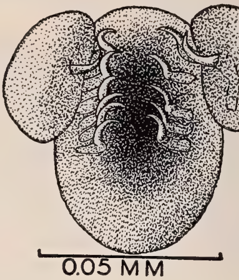

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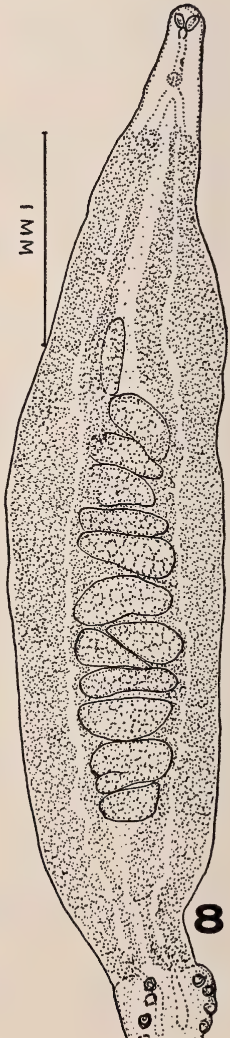

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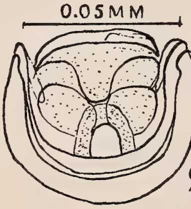

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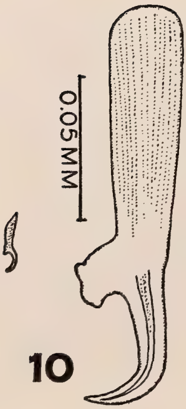

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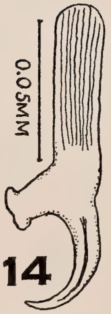

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den and Hesse, 1864; *O. truncata* Diesing, 1850; *O. major* Goto, 1894; *Octoplectanum truncatum* (Diesing, 1850) Diesing, 1858; *Kuhnia major* Yamaguti, 1953.

Description: Body lanceolate, 3.5 to 4.9 mm long by 0.68 to 1 mm wide. Prohaptoral suckers 0.057 to 0.068 mm wide. Opisthohaptor linguiform, 0.43 to 0.51 mm long by 0.30 to 0.51 mm wide, set off from body proper by slight constriction, bearing four pairs of clamps arranged in two more or less parallel rows and with two pairs of anchors near tip; clamps of mazocraeid type, 0.057 to 0.064 mm wide; lateral anchors 0.095 to 0.1 mm long, median anchors about 0.020 mm long. Oral aperture slightly subterminal; pharynx oval, 0.057 mm long by 0.040 mm wide; esophagus about 0.3 to 0.5 mm long; intestinal branches with numerous median and longer, branched lateral diverticula, terminating at or near level of most distal pair of opisthohaptoral clamps. Genital aperture median, 0.20 to 0.60 mm from anterior end of body. Genital corona consisting of five to six pairs of inner hooks arranged in two vertical rows, and a pair of somewhat larger lateral hooks which arise from kidney-shaped pads; inner hooks about 0.018 mm long, outer or lateral hooks about 0.030 mm long. Testes about 10 to 12 in number, median and largely postovarial. Ovary U-shaped, occupying anteriormost portion of testicular field. Genito-intestinal canal opening into right intestinal limb about level of proximal end of ovary. Vitelline follicles numerous, extending from shortly posterior to genital aperture to anterior margin of opisthohaptor. Eggs about 0.28 mm long by 0.18 mm wide, with polar prolongations about 0.32 mm long.

Hosts: Scomber scombrus and *Pomatomus saltatrix.*

Location: Gills.

Distribution: Europe, Asia and North America (Canada; United States: Baltimore, Maryland; Woods Hole, Massachusetts; Newport, Rhode Island; and New York, New York).

Specimens: USNM Helm. Coll. no. 35615 (four specimens, *Scomber scombrus,* Baltimore, Maryland, 10 May 1909); 35616 (one specimen, *S. scombrus,* New York Aquarium, 1911); 35617 (one specimen, *Pomatomus saltatrix,* New York Aquarium, 2 April 1912); 35618 (four specimens, *S. scombrus,* Woods Hole, Massachusetts, 23 July 1920); 35619 (one specimen, *S. scombrus,* New York Aquarium, 17 June 1915); 35620 (four specimens, *S. scombrus,* Baltimore, Maryland, 30 April 1927); and 35621 (six specimens, *S. scombrus,* Baltimore, Maryland, 10 October 1927). All of these specimens were collected by G. A. MacCallum.

Most of the specimens available were not in the best of condition,

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FIGS. 8–14. *Kuhnia scombri.* 8.—complete worm, male phase; 9.—opisthohaptoral clamp; 10.—opisthohaptoral anchors; 11.—genital corona; 12.—egg; 13.—complete worm, dorsal view—British specimen supplied by Hon. Miriam Rothschild; 14.—large opisthohaptoral anchor from British specimen.

showing evidence of considerable abuse in technique of preserving and staining. All of the specimens were in or approaching the male sex phase, as described by Sproston (1945), since the ovary showed varying degrees of atrophy. In general the specimens agreed in all essentials with those described by Parona and Perugia (1889), Goto (1894, 1899), Layman (1930), and Sproston (1945).

Kuhnia brevoortia Hargis, 1955

Fig. 19

Description: See Hargis (1955).

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

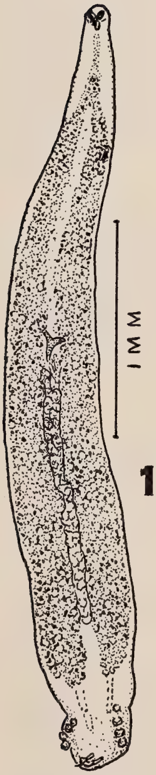
Specimen: USNM Helm. Coll. no. 37491 (holotype).

The description given by Hargis (1955a) is adequate except for the number of spines in the genital corona. An examination of the holotype specimen shows that there are twelve inner hooks or spines instead of eleven as given by Hargis. The arrangement of these hooks is similar to that described for *K. minor* (Goto), and for the species described later on in this paper as *K. singaporensis,* in that the two vertical rows converge posteriorly to form a semicircle. The large opisthohaptoral anchors are probably similar to those of the above mentioned species rather than to those of the other species of *Kuhnia,* but this cannot be determined with certainty because they are not in a position to be observed laterally.

Kuhnia singaporensis, new species

Figs. 20–23

Description: Body elongate, slender, 3.25 to 5 mm long by 0.4 to 0.5 mm wide. Prohaptoral suckers cup-like, about 0.050 mm in diameter. Opisthohaptor somewhat triangular, 0.4 to 0.5 mm long by 0.3 to 0.5 mm wide, bearing four pairs of mazocraeid-type clamps in convergent rows; clamps of anterior three pairs 0.054 to 0.060 mm long by 0.072 to 0.080 mm wide, those of posterior pair slightly smaller, 0.050 to 0.055 mm long by 0.063 to 0.070 mm wide; anchors two pairs, those of outer pair about 0.045 to 0.050 mm long with long, curved blade and short, solid roots and those of inner pair about 0.014 to 0.018 mm long. Oral aperture subterminal; pharynx oval, 0.023 mm long by 0.018 mm wide; esophagus about 0.6 mm long; intestine apparently as in other species, terminating at about level of third pair of opisthohaptoral clamps. Genital aperture immediately anterior to esophageal bifurcation. Genital corona consisting of five pairs of inner hooks arranged in converging vertical rows, forming an ill-defined semicircle, and a larger pair with outwardly directed tips; hooks of inner circle about 0.018 mm long, those of outer pair about 0.024 mm long, including roots. Vas deferens convoluted and distended with sperm. Testes indistinctly follicular, about 20 or more, extending in median field from level of anterior pole of ovary to about one-fifth of body length from posterior end. Ovary U-shaped, to right of median



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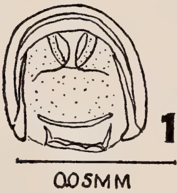

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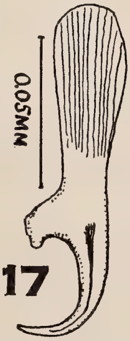

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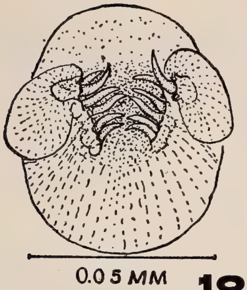

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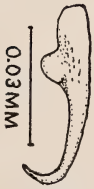

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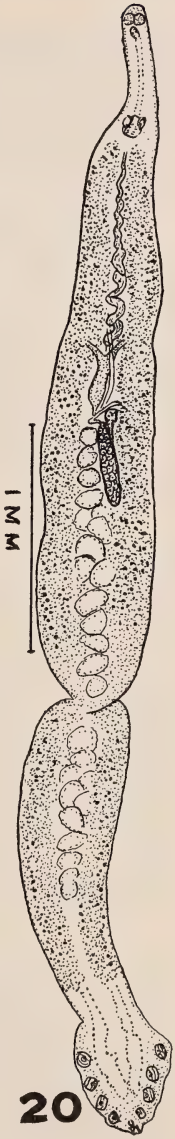

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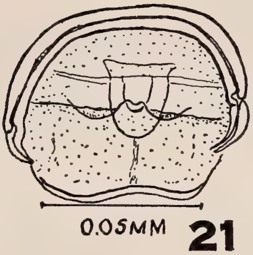

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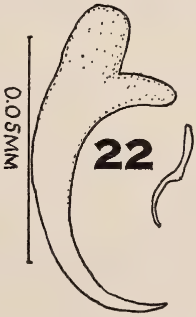

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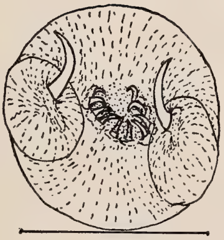

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Figs. 15–18. *Kuhnia thunni.* 15.—complete worm, ventral view; 16.—opisthohaptoral clamp; 17.—large opisthohaptoral anchor; 18.—genital corona.

Fig. 19. *Kuhnia brevoortia.* Large opisthohaptoral anchor.

Figs. 20–23. *Kuhnia singaporensis.* 20.—complete worm, twisted specimen; 21.—opisthohaptoral clamp; 22.—opisthohaptoral anchors; 23.—genital corona.

line. Genito-intestinal canal opening into right intestinal branch about level of anterior tip of ovary. Vitelline reservoir Y-shaped, preovarial; vitelline follicles extending from esophageal bifurcation to a short distance anterior to opisthohaptor. No eggs present.

Host: "Ikan Trubot."

Location: Gills.

Distribution: Asia (Singapore).

Specimens: USNM Helm. Coll. no. 36302 (syntypes).

This species is based on three specimens on a slide from the collection of the late G. A. MacCallum. They were presumably collected by his son, the late W. G. MacCallum, at Singapore, 20 July 1916. *Kuhnia singaporensis* resembles *K. minor* (Goto) and *K. brevoortia* Hargis more closely than any of the other species of the genus. It differs from *K. minor* particularly in having the opisthohaptor distinctly set off from the body and in not having the vitellaria extending into the haptoral area; in this respect it resembles *K. brevoortia.* The large anchors, on the other hand, are of the same type as those of *K. minor,* and different from those of the other species except possibly *K. brevoortia.*

Genus *Paramazocraes* Tripathi, 1959

Diagnosis: Opisthohaptor with clamps unequal in size, of mazocraeid type, with long, thin terminal lappet bearing three pairs of anchors. Genital corona with a pair of lateral hooks and four pairs of inner hooks, the latter dissimilar and in vertical rows, anterior two pairs sickle-like and posterior two pairs palmate. Vitelline follicles entering opisthohaptor. Vagina single, opening dorsally and medially.

Type species: Paramazocraes thrissocles Tripathi, 1959, from *Thrissocles mystax.*

Included species: Paramazocraes phasae Tripathi, 1959, from *Setipinna phasa.*

Both species of *Paramazocraes* are parasites of Indian fishes and will not be considered further in this paper.

Genus *Pseudanthocotyle* Bychowsky and Nagibina, 1954

Synonym: Indomazocraes Tripathi, 1959.

Diagnosis: Opisthohaptor with unequal clamps, anterior pair much larger than posterior three pairs, all of mazocraeid type, and with three pairs of anchors, those of outer pair much larger than inner pairs. Genital corona similar to that of *Kuhnia.* Vitelline follicles not entering opisthohaptor. Vagina apparently absent.

Type species: Pseudanthocotyle pavlovskyi Bychowsky and Nagibina, 1954, from *Scomber canagurta.*

Included species: Pseudanthocotyle jagannath (Tripathi, 1959) new combination (synonym: *Indomazocraes jagannath* Tripathi, 1959), from *Rastrelliger kanagurata.*

As no representative of this genus has been reported from North American hosts, it will not be considered further.

Neomazocraeinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of clamps of a modified mazocraeid type, and with two pairs of anchors. Genital corona similar to that of *Kuhnia.* Ovary convoluted, with distal end directed anteriad. Vitelline follicles entering opisthohaptor. Vagina Y-shaped, openings dorsolateral.

Type genus: Neomazocraes Price, 1943.

Genus *Neomazocraes* Price, 1943

Diagnosis: Characters of subfamily.

Type species: Neomazocraes dorosomatis (Yamaguti, 1938) Price, 1943 (synonym: *Discocotyle dorosomatis* Yamaguti, 1938), from *Dorosoma thrissa* and *Gonialosa manmina.*

Included species: Neomazocraes anadontostomae Tripathi, 1959, from *Anodontostoma chacunda.*

No representative of this genus is known to occur on North American hosts.

Mazocraeoidinae, new subfamily

Diagnosis: Opisthohaptor consisting of four pairs of mazocraeid clamps distributed along sides of body and embracing area occupied by gonads; anchors two or three dissimilar pairs. Genital corona of *Kuhnia* type. Vagina present or (?) absent.

Type genus: Mazocraeoides Price, 1936.

KEY TO GENERA OF MAZOCRAEOIDINAE

1.—Opisthohaptoral area embracing zones of ovary and testes .... *Mazocraeoides* Price

Opisthohaptoral area embracing zone of testes only .... *Pseudomazocraeoides* new genus

Genus *Mazocraeoides* Price, 1936

Synonym: Pseudocotyla Yamaguti, 1938.

Diagnosis: Opisthohaptoral clamps relatively small, usually open, occupying area embracing zones of ovary and testes. Vagina present or (?) absent.

Type species: Mazocraeoides georgei Price, 1936, from *Pomolobus pseudoharengus, P. mediocris,* and *Clupea harengus.*

Included species: Mazocraeoides dorosomatis (Yamaguti, 1938) Sproston, 1946, from *Dorosoma thrissa; M. gonialosae* Tripathi, 1959, from *Gonialosa manmina; M. hargisi* new species, from *Brevoortia patronus; M. nematalosae* Tripathi, 1959, from *Nematalosa nasus; M. olentangiensis* Sroufe, 1958 (synonym: *M. simile* Price, 1959), from *Dorosoma cepedianum; M. opisthonema* Hargis, 1955, from *Opisthonema oglinum; M. prashadi* Chauhan, 1952, from body surface of a clupeid fish; *M. tennesseensis* new species, from *Dorosoma cepedianum;* and *M.*

esmarkii (T. Scott, 1901) new combination,[6] from *Gadus esmarkii* Nielss. Of these, *M. georgei, M. hargisi, M. olentangiensis, M. opisthonema* and *M. tennesseensis* occur on North American hosts.

Mazocraeoides georgei Price, 1936

Figs. 24–27

Description: Body clavate to oval, 1.5 to 2.2 mm long by 0.34 to 0.76 mm wide. Prohaptor in form of a pair of suckers, 0.026 to 0.030 mm, opening into oral cavity. Opisthohaptor consisting of four pairs of clamps, ventrolateral, sessile or slightly pedunculated, occupying zone of testis and ovary, and of a small terminal lappet bearing three pairs of anchors. Clamps of open mazocraeid type, about 0.040 mm in length and width. Anchors of outer pair 0.060 to 0.065 mm long, those of intermediate pair about 0.012 mm long, and those of inner pair about 0.015 mm long. Oral aperture slightly subterminal; pharynx oval, 0.050 to 0.053 mm long by 0.026 to 0.030 mm wide; remainder of digestive system obscured by vitelline follicles. Genital aperture 0.14 to 0.21 mm from anterior end. Genital corona consisting of five to six pairs of inner hooks arranged in two vertical rows and one pair of lateral hooks, each situated on a reniform pad; hooks of inner rows about 0.009 to 0.010 mm long, outer hooks 0.010 to 0.014 mm long. Testis elongate, deeply lobed, in posterior third of body. Ovary U-shaped, to right of testis. Genito-intestinal canal strongly developed, curving around proximal tip of ovary and entering right intestinal limb near level of distal pole of ovary. Vitelline reservoir somewhat triangular to Y-shaped, lying largely in zone of proximal portion of ovary. Vaginal aperture dorsal, median, about 0.3 to 0.4 mm from anterior end. Vitelline follicles dense, extending from a short distance distal to genital aperture to posterior end of body, almost completely obscuring internal structures in most specimens. Egg about 0.23 mm by 0.068 mm, with polar prolongations of variable lengths.

Hosts: *Pomolobus pseudoharengus, P. mediocris,* and *Clupea harengus.*

Location: Gills.

Distribution: United States (Woods Hole, Massachusetts).

Specimens: USNM Helm. Coll. no. 8159 (nine specimens, *Pomolobus pseudoharengus,* 11 August 1908); 35079 (nine specimens, *P. pseudoharengus,* 29 July 1913); 35623 (syntypes) (seven specimens, *P. pseudoharengus,* 7 July 1913); 35624 (five specimens, *P. pseudoharengus,* 30

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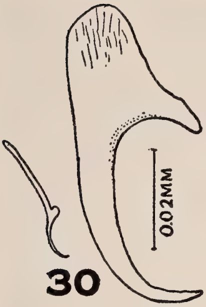
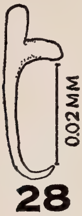
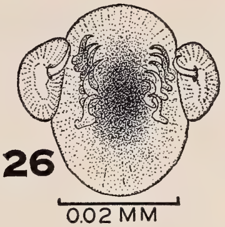
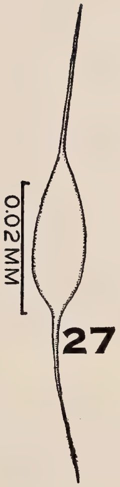
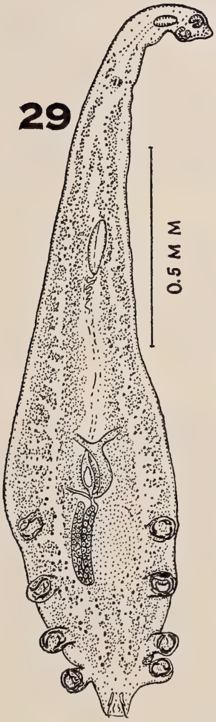
[6] The inclusion of *M. esmarkii* in the genus *Mazocraeoides* is questionable, since it was reported from a host other than that customarily parasitized by species of Mazocraeidae. The species in question was briefly described as *Octobothrium* (?) *esmarkii* by T. Scott (1901) from "the gills of a specimen of *Gadus esmarkii* Nilss., captured about sixty miles to the southeastward of Sumburgh Head, Shetland." The size given—scarcely 4 mm in length and about 2 mm in width—is considerably greater than for other species of *Mazocraeoides.* In spite of its host relationship, the brief description and figure seem to indicate its inclusion in this genus. It can hardly belong in the genus *Diclidophora,* in spite of its host, as Sproston (1946) suggests.

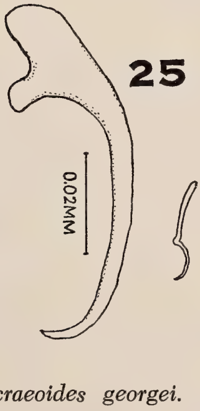


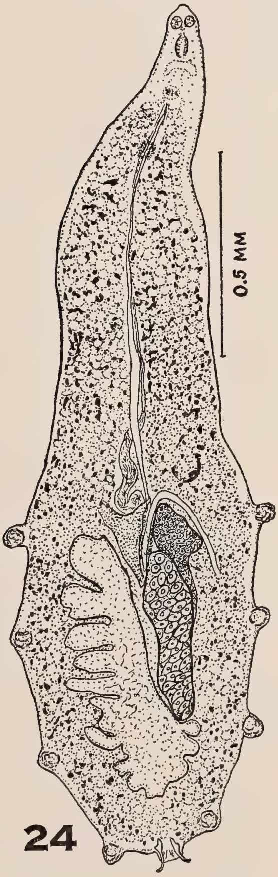












Figs. 24–27. *Mazocraeoides georgei.* 24.—complete worm, dorsal view; 25.—opisthohaptoral anchors; 26.—genital corona; 27.—egg.

Fig. 28. *Mazocraeoides opisthonema.* Large opisthohaptoral anchor.

Figs. 29–30. *Mazocraeoides olentangiensis.* 29.—complete specimen, greatly extended; 30.—opisthohaptoral anchors.

July 1912); 35625 (one specimen, *Clupea harengus,* 27 July 1913); 35626 (one specimen, *P. pseudoharengus,* 13 July 1922); and 35627 (nine specimens, *C. harengus,* 15 July 1924). Of these, those listed as 8159 were collected by Edwin Linton and all others were by G. A. MacCallum. The record from the hickory shad, *P. mediocris,* is based on Linton's (1940) record of one specimen having been collected from this host at Woods Hole, Massachusetts, 20 August 1910.

Most of the specimens available, with the exception of nos. 8159 and 35623, were in rather poor condition, having been excessively flattened or otherwise mistreated during preservation.

This species was originally described (Price, 1936) briefly as the type of a monotypic genus and the characters given were largely generic. Linton (1940) redescribed the species in greater detail and, subsequently, Hargis (1955a) gave a description of it based on a part of the original specimens (USNM Helm. Coll. no. 35623) from the MacCallum Collection (not Linton's as stated). This description was as accurate as the condition of the specimens would permit except for the number of hooks in the genital corona. He stated that there were "three pairs of dorsally curved spines" but actually there are five to six pairs. Hargis also pointed out that the eggs were variable in shape, some with filaments at both ends, others with none. This statement is correct. However, it appears reasonably obvious from a study of the eggs that those without filaments were abnormally developed, the filaments being represented by small, button-like knobs at the poles.

Mazocraeoides hargisi, new species

Synonym: Mazocraeoides georgei, of Hargis, 1955, not Price, 1936.

Description: See Hargis (1955).

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

Hargis (1955) gave two descriptions of *Mazocraeoides georgei* Price, one based on specimens from the MacCallum collection and the other on material which he collected from Gulf Menhaden in Florida. In the paper mentioned, and also later, Hargis (1955b, 1959) pointed out that the specimens differed noticeably and consistently from those from *Promolobus* spp. However, "he did not wish to mix the two groups because specific separation might later be necessary." While the present writer has not been able to secure Hargis' material for study, a comparison of his description with specimens of *M. georgei* from the MacCallum collection showed that the two forms are unquestionably similar. However, since the measurements, particularly of the anchors and other hard parts, show considerable differences, in addition to differences in hosts, it seems preferable to regard the form from *Brevoortia patronus* as distinct from *M. georgei* and propose for it the name *Mazocraeoides hargisi* new species.

Mazocraeoides opisthonema Hargis, 1955

Fig. 28

Description: See Hargis (1955).

Host: Opisthonema oglinum.

Location: Gills.

Distribution: United States (Tampa Bay, Florida).

Specimen: USNM Helm. Coll. no. 37490 (holotype).

The description of this species as given by Hargis (1955b) appears to be as accurate as the condition of the specimen permits. An examination of the holotype specimen showed it to be somewhat mutilated, apparently due to excessive pressure during mounting, and was not well stained differentially. Aside from the features mentioned by Hargis, the small size of the opisthohaptoral anchors appears to be distinctive.

Mazocraeoides olentangiensis Sroufe, 1958

Figs. 29–30

Synonyms: Mazocraeoides similis Price, 1959; (?) *Mazocraes cepedianum* Kimpel, 1938 (nomen nudum).

Description: See Sroufe (1958).

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Ohio, Tennessee, Alabama and (?) Illinois).

Specimens: USNM Helm. Coll. nos. 38339 (holotype) and 38340 (paratypes)—collected by Stanley A. Sroufe, Jr., from Olentangy River near Columbus, Ohio; 37711 and 37712—collected by Ralph G. Bangham from Norris and Reelfoot Lakes, Tennessee, respectively; and 37713—collected by E. W. Price from Tennessee River at Guntersville, Alabama.

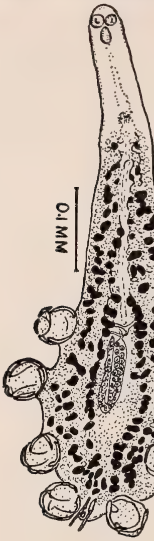
A study of the specimens listed above shows that Sroufe's (1958) description is adequate and need not be repeated here. The species, aside from host relationship and other differences listed by Sroufe, may easily be distinguished from *Mazocraeoides georgei* in the absence of a vaginal opening and in the morphology of the large anchors.

The inclusion in the synonomy of *Mazocraes capedianum* Kimpel (1938) is questionable since there are at present at least four species of mazocraeids known from that host. However, since *M. olentangiensis* is the species commonly found on that host, it appears more than likely this was the form Kimpel had before him.

Mazocraeoides tennesseensis, new species

Figs. 31–34

Description: Body clavate, 0.38 to 0.67 mm long by 0.1 to 0.3 mm wide in haptoral region. Prohaptoral suckers circular, about 0.016 mm in diameter. Opisthohaptor consisting of four pairs of open type mazocraeid clamps, situated along body margins and embracing greater portion of posterior half of body, and two pairs of terminal anchors; clamps



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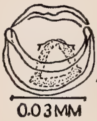

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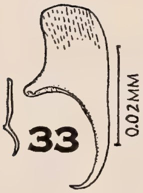

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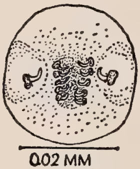

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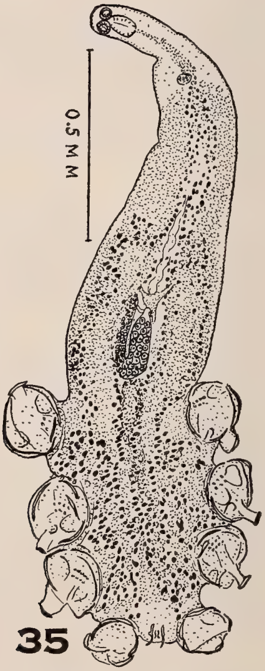

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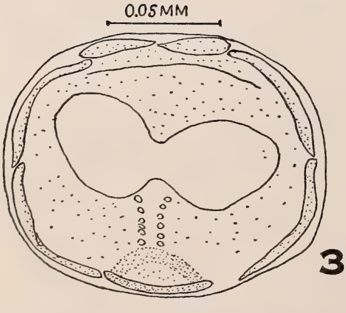

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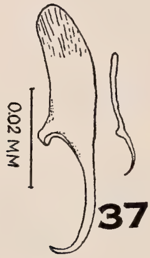

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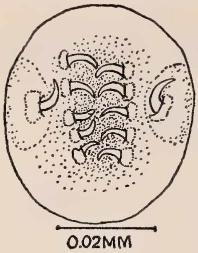

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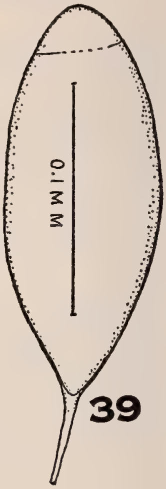

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FIGS. 31–34. *Mazocraeoides tenesseensis.* 31.—complete worm, ventral view; 32.—opisthohaptoral clamp; 33.—opisthohaptoral anchors; 34.—genital corona.

FIGS. 35–39. *Pseudomazocraeoides megalocotyle.* 35. — complete worm, ventral view; 36.—opisthohaptoral clamp; 37.—opisthohaptoral anchors; 38.—genital corona; 39.—egg.

approximately uniform, about 0.040 to 0.048 mm wide; outer anchors 0.040 to 0.044 mm long, inner about 0.018 to 0.020 mm long. Pharynx oval, about 0.020 mm long by 0.016 mm wide. Esophagus about 0.16 mm long; intestine similar to that of other mazocraeids, containing numerous large masses of dark granules. Genital aperture prefurcal, about 0.13 mm from anterior end of body. Genital corona consisting of two vertical rows of inner hooks, five to each row, and a pair of outer hooks; inner hooks about 0.005 to 0.006 mm long, outer hooks about 0.010 mm long. Testis apparently unlobed, posterolateral to ovary. Ovary U-shaped, occupying zone roughly representing that of the anterior two pairs of opisthohaptoral clamps. Genito-intestinal canal present, opening into right intestinal branch slightly anterior to level of ovarian poles. Vitelline reservoir Y-shaped, preovarial. Vitelline follicles extending from slightly distal to genital aperture to posterior end of body. Vagina not observed. Egg oval, 0.170 to 0.175 mm long by 0.065 to 0.075 mm wide, provided with relatively long posterior filament.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot Lake, Tennessee).

Specimens: USNM Helm. Coll. no. 37714 (syntypes).

The above description is based on 16 specimens collected in 1941 from gizzard shad caught in Reelfoot Lake by Ralph G. Bangham. This species is distinct from all other members of the genus in the relatively large opisthohaptoral clamps in comparison with body size, in size and shape of anchors, and in the heavily pigmented intestinal tract.

Pseudomazocraeoides, new genus

Synonym: Mazocraeoides Price, 1936, in part.

Diagnosis: Opisthohaptoral clamps relatively large, open, of mazocraeid type, embracing zone of testes only. Vagina (?) absent.

Type species: Pseudomazocraeoides megalocotyle (Price, 1959) new combination.

Pseudomazocraeoides megalocotyle (Price, 1959)

Figs. 35–39

Synonym: Mazocraeoides megalocotyle Price, 1959.

Description: Body clavate, 1.6 to 1.75 mm long by 0.34 to 0.40 mm wide in opisthohaptoral region. Prohaptoral suckers circular, about 0.040 mm in diameter. Opisthohaptor consisting of four pairs of relatively large, slightly pedunculate, open, mazocraeid clamps situated along margins of body and occupying greater part of posterior third of body length; anterior three pairs of clamps 0.16 by 0.14 mm and posterior pair 0.12 mm in diameter; anchors consisting of an outer pair about 0.040 mm long and an inner pair about 0.020 mm long, situated on an indistinct lappet between posterior pair of clamps. Pharynx oval, about 0.070 mm long by 0.040 mm wide. Esophagus long, about one-third or more of total body length, heavily pigmented; intestine with numerous median and lateral, heavily pigmented diverticula, extending to level of posterior pair of opisthohaptoral clamps. Genital aperture about 0.20 to 0.28 mm from anterior end of body. Genital corona of *Kuhnia* type, consisting of two vertical rows of five inwardly directed hooks each and a pair of lateral, outwardly curved, hooks; inner hooks about 0.012 mm long; outer hooks about 0.015 mm long. Testis apparently deeply lobed, median, in opisthohaptoral zone. Ovary U-shaped, in median field slightly anterior to level of proximal pair of opisthohaptoral clamps. Genito-intestinal canal opening into right intestinal limb at or near level of proximal pole of ovary. Vitelline reservoir Y-shaped, immediately preovarial. Vitelline follicles numerous, extending from slightly distal to genital aperture almost to posterior end of body. Vagina not observed. Eggs not present in specimens available.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot Lake, Tennessee).

Specimens: USNM Helm. Coll. no. 37715 (syntypes).

Clupecotylinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of pedunculate, dorsoventrally reversed, mazocraeid clamps; terminal lappet bifid, each portion bearing an anchor. Esophagus about one-half length of body, with lateral diverticula. Intestine diverticulate, confluent distally. Genital corona of *Kuhnia* type. Oval, crater-like structure of unknown function on ventral side near anterior end of body.

Type genus: Clupecotyle Hargis, 1955.

This subfamily contains two genera which may be separated as follows:

KEY TO GENERA OF CLUPECOTYLINAE

1.—Opisthohaptoral clamps about equal in size .... *Clupecotyle* Hargis
Opisthohaptoral clamps unequal in size .... *Neoclupecotyle* new genus

Genus *Clupecotyle* Hargis, 1955

Diagnosis: Opisthohaptor provided with four pairs of pedunculate clamps of equal size. Vitelline follicles entering opisthohaptor. Other characters as for subfamily.

Type species: Clupecotyle brevoortia Hargis, 1955, from *Brevoortia patronus* and *B. tyrannus.*

Included species: Clupecotyle lintoni (Koratha, 1955) Hargis, 1959, from *Brevoortia gunteri.*

Clupecotyle brevoortia Hargis, 1955

Figs. 40–41

Synonym: Dactylocotyle sp. Linton, 1901.

Description: The description given by Hargis (1955) appears to be adequate and need not be repeated here.

Hosts: Brevoortia patronus and *B. tyrannus.*

Location: Gills.

Distribution: United States (Alligator Harbor, Florida; Woods Hole, Massachusetts; and Beaufort, North Carolina).

Specimens: USNM Helm. Coll. nos. 37492 (holotype) and 51569.

Four specimens of what appears to be this species were found in the collection of the late H. B. Ward (USNM no. 51569). These had been collected 1 July 1916 from *Brevoortia tyrannus* by A. R. Cooper at Woods Hole, Massachusetts. A comparison of these with the holotype and with Hargis' description indicated that they were identical. Cooper's specimens were on the whole slightly larger than those from Florida—2.7 to 4.7 mm long by 0.60 to 0.85 mm wide; anchors 0.057 to 0.066 mm long; egg 0.285 long by 0.067 mm wide and polar filaments about 0.20 mm long—but otherwise showed no significant differences. No connections with any structure that might be regarded as a vagina were observed with the oval ventral structure that Hargis reported as possibly being a vaginal aperture. The function of this structure is unknown, but the possibility that it may serve as a haptor or adhesive structure is suggested.

The occurrence of this parasite on *Brevoortia tyrannus* makes it almost certain that the specimen reported from that host by Linton (1905) from Beaufort, North Carolina, as *Dactylocotyle* sp. was *C. brevoortia* rather than *C. lintoni* Koratha, assuming that these species are actually distinct.

Clupecotyle lintoni (Koratha, 1955) Hargis, 1959

Fig. 42

Synonym: Diclidophora lintoni Koratha, 1955.

Description: See Koratha (1955).

Host: Brevoortia gunteri.

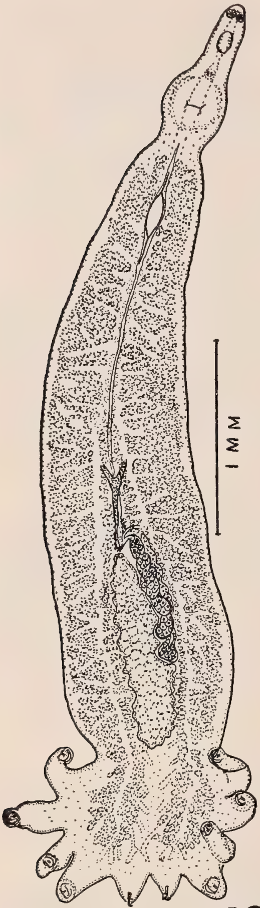
Location: Gills.

Distribution: United States (Port Aransas, Texas).

Specimen: USNM Helm. Coll. no. 54759 (holotype).

A study of the holotype shows that the description given by Koratha (1955) is about as complete as the condition of the specimen permits. In addition to mutilation of the opisthohaptor, the specimen is broken into three parts. It has the appearance of having been allowed to dry, causing it to become brittle and interfering with its ability to stain properly. The hooks of the genital coronet could not be made out with certainty but they appear similar to those of *C. brevoortia* Hargis. The structure near the genital aperture, which Koratha thought was "probably an egg," is the sucker-like ventral depression that Hargis regarded as the vaginal aperture in *C. brevoortia.*

There is little reason to believe that *C. lintoni* is distinct from *C. brevoortia* other than its somewhat smaller size and host. It is probable when an adequate study can be made from additional and better specimens that *C. lintoni* will be found to be a synonym of *C. brevoortia,* as Hargis (1959) suspects.



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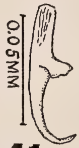

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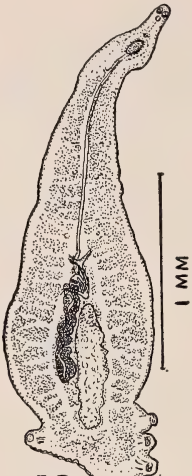

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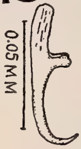

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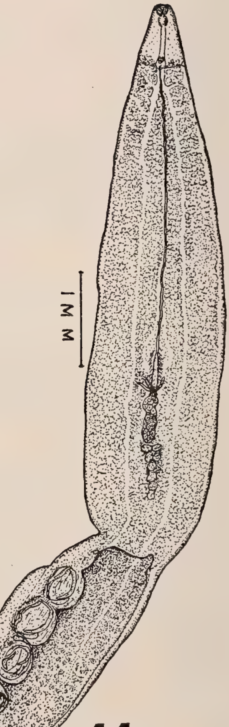

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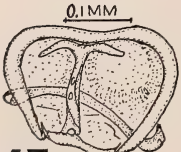

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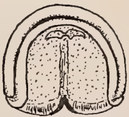

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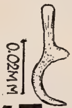

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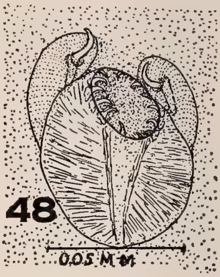

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Figs. 40–41. *Clupecotyle brevoortia.* 40.—complete worm, dorsal view, from *Brevoortia tyrannus;* 41.—opisthohaptoral anchor.

Fig. 42. *Clupecotyle lintoni.* Holotype, ventral view.

Fig. 43. *Neoclupecotyle megaconfibula,* opisthohaptoral anchor.

Figs. 44–48. *Grubea pneumatophori.* 44.—holotype, ventral view;

Neoclupecotyle, new genus

Diagnosis: Anterior two pairs of opisthohaptoral clamps much larger than posterior two pairs. Vitelline follicles not extending into opisthohaptor. Other characters as for subfamily.

Type species: Neoclupecotyle megaconfibula (Hargis, 1955) new combination.

This genus differs from *Clupecotyle* mainly in the marked disparity in the size of the opisthohaptoral clamps. The validity of this character may be questioned by some workers but it can hardly be an aberrancy as Hargis (1955a) suggested, especially since the genera *Pseudanthocotyle* Bychowsky and Nagibina, 1954 (Kuhniinae), *Pseudanthocotyloides* Price, 1960 (Mazocraeinae) and *Anthocotyle* Beneden and Hesse, 1863 (Anthocotylidae) were based largely on comparable characters. So far the genus contains only the type species.

Neoclupecotyle megaconfibula (Hargis, 1955)

Fig. 43

Synonym: Clupecotyle megaconfibula Hargis, 1955.

Description: The description given by Hargis (1955) is adequate and need not be repeated.

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

Specimen: USNM Helm. Coll. no. 37493 (holotype).

Grubeinae, new subfamily

Synonym: Pleurocotylinae Monticelli, 1903.

Diagnosis: Opisthohaptor asymmetrical, scoop-shaped, with four modified mazocraeid clamps in a vertical row along right margin and a single minute clamp on left side, comparable in position to most posterior of right clamps; terminal lappet armed with two pairs of dissimilar anchors. Genital corona consisting of a circle of inner hooks and a pair of lateral, outwardly curved hooks. Other characters as in Mazocraeidae.

Type genus: Grubea Diesing, 1858.

Genus *Grubea* Diesing, 1858

Synonyms: Pleurocotyle Gervais and Beneden, 1859; *Pleurocotylus* Gervais and Beneden, 1859.

Diagnosis: Characters of subfamily.

Type species: Grubea cochlear Diesing, 1858, from *Scomber scombrus* and *S. colias.*

Included species: Grubea pneumatophori new species from *Pneumatophorus grex.*

45.—large clamp from right side of opisthohaptor; 46.—small clamp from left side of opisthohaptor; 47.—large opisthohaptoral anchor; 48.—genital corona.

Grubea pneumatophori, new species

Figs. 44–48

Synonym: Pleurocotyle scombri, of Linton, 1940, not Gervais and Beneden, 1859.

Description: Body 8.6 mm long by 1.5 mm wide; anterior part lanceolate, separated from scoop-shaped opisthohaptoral portion by slight constriction. Prohaptoral suckers oval, 0.096 mm long by 0.056 mm wide. Opisthohaptor concave, bearing a row of four clamps on right side and a minute clamp on left side opposite most distal of large clamps; first three of large clamps somewhat larger than most distal one but distorted so that measurements would be of little value; distal large clamp about 0.43 mm wide; small left clamp about 0.044 mm wide. Terminal lappet of opisthohaptor delicate, bearing two pairs of anchors, outermost about 0.040 mm long, innermost about 0.028 mm long. Oral aperture subterminal; pharynx oval, 0.09 mm long by 0.08 mm wide; esophagus bifurcating about 0.86 mm from anterior end; intestinal branches extending almost to end of body, with short median and longer, lateral dendritic diverticula. Genital aperture about 0.6 mm from anterior end of body; genital corona consisting of a circle of 13, possibly 14, inwardly curved hooks, about 0.02 mm long on a muscular bulb-like structure and two outwardly curved hooks, about 0.02 mm long, each on a muscular pad lateral to bulb. Testes relatively few, number not ascertainable, in median field, postovarial. Ovary U-shaped, in median field. Vitelline follicles occupying almost entire body from level of genital aperture to posterior end of opisthohaptor. Vagina double, openings dorsolateral and only slightly posterior to level of genital aperture. No eggs present.

Host: Pneumatophorus grex.

Location: Gills.

Distribution: United States (Woods Hole, Massachusetts).

Specimen: USNM Helm. Coll. no. 8160 (holotype).

This species was described by Linton (1940) as *Pleurocotyle scombri* (Gervais and van Beneden) from a single specimen, collected 9 August 1908, from the gills of a chub mackerel. The specimen was in fair condition but not well stained. It had also been abused during the process of fixing so that the opisthohaptoral clamps and genital corona were somewhat distorted.

That this species may be identical with the European *G. cochlear* Diesing (= *Pleurocotyle scombri* Gervais and Beneden, = *Octobothrium scombri* Grube, not Kuhn) cannot be denied. However, there are some differences such as size of opisthohaptoral clamps, number and arrangement of genital hooks, and host that suggest that the two species are distinct. The size of the large opisthohaptoral clamps are figured by European authors as equal in size whereas in the American species the most posterior clamp is distinctly smaller than the others. The genital hooks are given by Parona and Perugia (1890) as 16 of which the laterals are strongest. Palombi (1949) gave the number as 13 and no laterals were mentioned. In the species considered herein there are 13, possibly 14, inner hooks arranged in a circle on a conspicuous muscular bulb and one pair of laterals, each situated on a distinct pad as in other mazocraeids.

Family Plectanocotylidae Poche, 1925

Synonym: Hexacotylidae Monticelli, 1899 (not based on any corresponding genus, hence invalid).

Diagnosis: Body elongate. Prohaptor in form of two suckers opening into oral cavity. Opisthohaptor provided with three to four pairs of clamps and a terminal hook-bearing lappet; ventral loop elements not fused medially; middle loop elements either not fused medially or united by a bow-shaped piece; center piece more or less scoop-shaped, suggesting that of mazocraeids; anchors two or three pairs, unequal and dissimilar, outer pair larger. Genital corona consisting either of a sheaf of slender spines or a cuticularized sheath-like structure. Testes numerous, either postovarial or both pre- and postovarial. Ovary U-shaped, with limbs directed posteriad. Vitelline follicles extending from near genital atrium to opisthohaptor. Genito-intestinal canal present. Vagina absent.

Type genus: Plectanocotyle Diesing, 1850.

This family contains at present only two genera. These differ in the number of opisthohaptoral clamps and in other characters of equivalent value to those used for subfamily separation in other families. Consequently, the family Plectanocotylidae is here divided into two monogeneric subfamilies, namely Plectanocotylinae Monticelli, 1903, and Octoplectanocotylinae, new subfamily.

KEY TO SUBFAMILIES OF PLECTANOCOTYLIDAE

1.—Opisthohaptor with three pairs of clamps .... Plectanocotylinae Monticelli
Opisthohaptor with four pairs of clamps .... Octoplectanocotylinae, new subfamily

Subfamily Plectanocotylinae Monticelli, 1903

Diagnosis: Opisthohaptor bearing three pairs of clamps and terminal lappet armed with two to three pairs of anchors. Genital corona consisting of a sheaf of needle-like spines. Testes postovarial.

Type genus: Plectanocotyle Diesing, 1850.

Genus *Plectanocotyle* Diesing, 1850

Synonyms: Phyllocotyle Beneden and Hesse, 1863; *Plectanophora* Diesing, 1858; *Plectanophorus* Diesing, 1858; *Platycotyle* Beneden and Hesse, 1863.

Diagnosis: Characters of subfamily.

Type species: Plectanocotyle elliptica Diesing, 1850, from *Labrax mucronatus* (= *Morone americana*).

Included species: Plectanocotyle gurnardi (Beneden and Hesse, 1863) Llewellyn, 1941 (synonyms: *P. caudata* Lebour, 1908, *P. lorenzii* Monticelli, 1899, vide Llewellyn (1941), and *Platycotyle gurnardi* Beneden and Hesse, 1863, vide Sproston (1946), from *Trigla gurnardus, T. lucerna* (= *T. hirundo*), *T. cuculus* (= *T. pini*), and *T. lineata.*

Earlier the writer (Price, 1936) in an abstract listed both *Phyllocotyle* Beneden and Hesse and *Plectanocotyle* Diesing as distinct genera. Because of space limitations the rationale for this action could not be given in the abstract. However, the reasoning at that time was that the description of the type of *Plectanocotyle* was inadequate for identification and that the host belonged to a different family than that of *Phyllocotyle.* The only resemblance between the two genera was the three pairs of opisthohaptoral clamps. No hook-bearing lappet was described for *Plectanocotyle,* suggesting that *P. elliptica* was based on a mutilated specimen. Since this species has not been reported again from the type, or any other host, it seems possible that either the host fish had been misidentified or the specimen had been mislabeled as to origin.

In spite of the fact that the species on which *Plectanocotyle* is based is unrecognizable, the writer is following Sproston (1946) Bychowsky (1957) and others in accepting *Plectanocotyle* and *Phyllocotyle* as possibly identical genera. He is doing so, however, only to preserve the availability of an old genus as he did in the case of *Erpocotyle* Beneden and Hesse (Hexabothriidae) and *Cyclocotyla* Otto (Diclidophoridae). In this connection, it may be noted that both of the abovementioned authorities recognized without question the validity of *Plectanocotyle* and at the same time rejected both the better characterized *Erpocotyle* and *Cyclocotyla* as unrecognizable.

Plectanocotyle elliptica Diesing, 1850

Fig. 7

Synonym: Plectanophorus ellipticus (Diesing, 1850) Diesing, 1858.

Description: The only descriptions of this species are those of Diesing (1850, 1858) or of others based on these. Diesing's (1858) description is only slightly modified from that given earlier; it is quoted here as follows:

"Corpus lata ellipticum planum. Caput corpore continuum. Os terminale prominulum. Repla sex in postico corporis margino, ventralia, serie simplici, bivalvia, valvulus convexiusculus oppositis, valvula singula fulcris duodus unciformibus apice arcuatim conniventibus et tertio intermedio breviore recto, articulatis membrana inter se juctis. Acetabula duo juxtaposita hemisphaerica infra os sita. Genitalium aperturae . . . Porus excretorius . . . Tractus intestinalis bicruris coccus—Ovipara—Piscium marinorus ectoparasita."

"Longit. 2‴; latit. 1‴."

Host: Labrax mucronatus (= *Morone americana*).

Location: Gills.
Distribution: America.

This species appears not to have been collected since Koller in 1836 obtained the specimens on which Diesing based the above description. It is included here because the host from which the specimens were collected occurs only in American waters.

Octoplectanocotylinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of clamps and a terminal lappet bearing two pairs of dissimilar anchors. Genital armature consisting of a striated cuticularized tube or of slender spines. Testes pre- and postovarial.

Type genus: Octoplectanocotyla Yamaguti, 1937.

Genus *Octoplectanocotyla* Yamaguti, 1937

Diagnosis: Characters of subfamily.

Type species: Octoplectanocotyla trichiuri Yamaguti, 1937, from *Trichiurus japonicus* in Japan. Tripathi (1959) reports what he regards as this species from *Trichiurus muticus* and *T. savala* in India. Assuming the correctness of Yamaguti's (1937) observation on the nature of the genital armature, Tripathi's species can hardly be the same as *O. trichiuri.*

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HYBRIDIZATION IN U. S. TREEFROGS OF THE GENUS *HYLA*

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The experimental combination of anuran gametes has proved to be an important source of information in investigation of species relationships and of post-mating reproductive isolation. The purpose of this report is to present a list of recent hybrid crosses involving U. S. species of the genus *Hyla*. Only those crosses that have been attempted since the appearance of Moore's (1955) review are included here.

For most hybrid combinations, the terminology of the latest developmental stage reached is that of the author cited. The twelve crosses for which there are no author citations were performed by us. In describing our results, the term "adult" is used if the hybrid attained a size as large as sexually mature frogs of the smallest parental species. Crosses reported by Johnson (1959) between the call races of *Hyla versicolor* are not included in this list since their taxonomic status is still uncertain.

This work was supported by National Science Foundation grants No. G-13275 to Kennedy and No. G-5494 to Pyburn.

FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Gastrophryne carolinensis	*Hyla squirella*	no fertilization	Volpe, 1956
Hyla arenicolor	*Hyla femoralis*	metamorphosed, nearly grown	W. F. Blair, 1958
Hyla arenicolor	*Hyla avivoca*	metamorphosed, nearly grown	W. F. Blair, 1958
Hyla arenicolor	*Hyla versicolor*	metamorphosed, nearly grown	W. F. Blair, 1958

FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Hyla arenicolor	*Hyla regilla*	yolk plug	W. F. Blair, 1958
Hyla avivoca	*Hyla versicolor*	normal larvae, through metamorphosis	Mecham, 1960a
Hyla avivoca	*Hyla femoralis*	not stated	Mecham, 1960a
Hyla cinerea	*Hyla avivoca*	adult	
Hyla cinerea	*Hyla gratiosa*	adult	
Hyla cinerea	*Hyla gratiosa*	normal larvae, through metamorphosis	Mecham, 1960b
Hyla cinerea	Natural hybrid (*H. cinerea*–*H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Natural hybrid (*H. cinerea*–*H. gratiosa*)	*Hyla cinerea*	normal larvae, through metamorphosis	Mecham, 1960b
Natural hybrid (*H. cinerea*–*H. gratiosa*)	Natural hybrid (*H. cinerea*–*H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Hyla cinerea	*Hyla squirella*	adult	
Hyla cinerea	*Hyla versicolor*	adult	
Hyla cinerea	*Hyla crucifer*	tadpole	
Hyla cinerea	*Hyla baudini*	tadpole	
Hyla cinerea	*Hyla raniformis*	tadpole	
Hyla cinerea	*Pseudacris clarki*	tadpole	
Hyla cinerea	*Acris crepitans*	tadpole	
Hyla crucifer	*Pseudacris streckeri*	young frog	Mecham, 1957
Hyla crucifer	*Pseudacris nigrita*	cleavage, no normal larvae	Mecham, 1957
Hyla crucifer	*Pseudacris nigrita*	young frog	Crenshaw, 1958
Hyla crucifer	*Pseudacris nigrita*	young frog	Gosner, 1956
Hyla gratiosa	*Hyla versicolor*	hatched	W. F. Blair, 1958
Hyla gratiosa	*Hyla cinerea*	maturity	W. F. Blair, 1958
Hyla gratiosa	*Hyla cinerea*	normal larvae, through metamorphosis	Mecham, 1960b
Hyla gratiosa	Natural hybrid (*H. cinerea*–*H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Hyla gratiosa	*Hyla arborea*	tadpole	W. F. Blair, 1958

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FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Hyla squirella	*Gastrophryne carolinensis*	no fertilization	Volpe, 1956
Hyla versicolor	*Hyla baudini*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla squirella*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla avivoca*	normal larvae, through metamorphosis	Mecham, 1960a
Hyla versicolor	*Hyla cinerea*	young tadpole	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla avivoca*	adult	
Hyla versicolor	F_1 (♀ *H. versicolor* × ♂ *H. avivoca*)	adult	
Hyla versicolor	Natural hybrid (*H. avivoca–H. versicolor*)	normal larvae, through metamorphosis	Mecham, 1960a
Hyla versicolor	*Hyla femoralis*	adult	Pyburn, 1960
Hyla versicolor	F_1 (♀ *H. versicolor* × ♂ *H. femoralis*)	adult	
Hyla versicolor	*Pseudacris clarki*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Bufo compactilis*	tail bud	Pyburn and Kennedy, 1960
Hyla versicolor	*Gastrophryne olivacea*	blastula	Pyburn and Kennedy, 1960
Pseudacris nigrita	*Hyla crucifer*	adult	Crenshaw, 1958
Pseudacris nigrita	F_1 (♀ *P. nigrita* × ♂ *Hyla crucifer*)	tail bud	Crenshaw, 1958
Pseudacris nigrita	*Hyla crucifer*	young frog	Gosner, 1956
Pseudacris streckeri	*Hyla crucifer*	young tadpole	Mecham, 1957

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TADARIDA AURISPINOSA (PEALE) (CHIROPTERA: MOLOSSIDAE) IN NORTH AMERICA

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On 20–21 November 1959, Clyde F. Herreid, Arturo Jiménez, and the senior author visited the Cueva del Abra, 6 miles NNE of Antiguo Morelos, Tamaulipas, México (see Villa, Jour. Mamm., 41: 314–319, 1960) where they collected more than 100 specimens of *Tadarida yucatanica* (Miller) (= *T. laticaudata ferruginea* Goodwin). Also collected were four specimens of a larger bat which at the time was thought to be *T. femorosacca* (Merriam). Three of the larger *Tadarida* were alive and were taken back to the Instituto de Biologia, Universidad Nacional Autónoma de México, by Jiménez who wished to examine them for rabies. The fourth specimen was prepared as a skin and skull and deposited in the Texas Cooperative Wildlife Collection as No. 6573. Jiménez later prepared his three specimens as skins and skulls for the Instituto de Biologia mammal collection (Nos. 4838, 4839, and 4841). All the bats were collected with a .22-calibre shot pistol and a .410-gauge shotgun either from the walls and ceiling of the cave or from the evening flight as the bats left the cave. Whether the larger bats came from the walls and ceiling or from the evening flight is not known.

On 17 June 1960, Craig E. Nelson and the senior author again collected *Tadarida* from the evening flight as the bats left Cueva del Abra. As in November 1959, there were 10,000 to 20,000 *Tadarida* in the cave. *T. yucatanica* left the cave more or less in groups of varying size and occasionally bats of a size larger than *T. yucatanica* were seen leaving the cave. One of them (TCWC 6574) was collected, and it proved to

TABLE 1.—External measurements of bats referred to *Tadarida aurispinosa.* The type (No. 3726) and No. 6574 TCWC were measured by Handley, the other five by Carter.

MUS. NO.	LOCALITY	HIND FOOT	TIBIA	FOREARM	III META-CARPAL	DIGIT III, PHALANX 1	DIGIT III, PHALANX 2	IV META-CARPAL	DIGIT IV, PHALANX 1	DIGIT IV, PHALANX 2	V META-CARPAL	DIGIT V, PHALANX 1	DIGIT V, PHALANX 2
USNM 3726 ♂	Brazil	11.0	13.6	50.0	50.1	21.1	19.9	48.1	18.8	3.2	28.7	15.3	3.7
CNHM 68561 ♀	Cuzco, Peru	9.9	13.8	51.4	48.4	21.1	18.5	46.8	18.1	2.8	26.9	14.6	3.4
TCWC 6573 ♂	Tamaulipas, México	10.3	13.7	50.3	47.9	21.5	19.4	47.3	18.6	2.8	27.5	14.1	3.7
TCWC 6574 ♂	Tamaulipas, México	10.0	13.3	49.9	49.3	20.3	18.5	47.4	17.4	2.4	27.9	14.7	3.7
IB 4838 ♂	Tamaulipas, México	10.4	13.1	49.7	48.2	21.4	18.8	46.8	18.7	2.9	26.6	15.0	3.7
IB 4839 ♀	Tamaulipas, México	9.9	13.2	49.2	46.9	21.2	17.4	46.4	17.8	2.7	27.0	13.8	3.9
IB 4841 ♀	Tamaulipas, México	10.5	13.7	47.8	46.2	20.9	18.3	44.9	17.6	3.2	26.0	14.3	3.8

be the same as the large *Tadarida* previously collected there. Since the small clusters of bats seen on the walls and ceiling can account for only a small part of the numbers that roost in the cave, the great majority of the *Tadarida* spend the day in the numerous crevices.

Upon comparison with *T. femorosacca,* it became obvious that the large bats from Cueva del Abra could not be associated with that species. They are larger than *T. yucatanica, T. femorosacca, T. laticaudata* (E. Geoffroy), and *T. europs* (H. Allen), but smaller than *T. molossa* (Pallas). They compared favorably with *T. similis* Sanborn. One of the specimens was sent to Charles O. Handley, U.S. National Museum, to be compared with the type of *T. aurispinosa* (Peale). Handley made the following comments. "Externally, I cannot see any means of distinguishing your specimen from *aurispinosa.* Measurements coincide almost exactly . . . and coloration apparently is similar." The other Mexican specimens (collected in November) are somewhat grayish in color and would seem to correspond more closely to the type of *T. similis* which is described as grayish brown. As shown in the tables, the Mexican

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TABLE 2.—Cranial measurements of bats referred to *Tadarida aurispinosa.* Measurements of the type of "*similis*" (CNHM 48560) after Sanborn.

MUS. NO.	LOCALITY	TOTAL LENGTH	ZYGOMATIC BREADTH	INTERORBITAL BREADTH	OCCIPITAL DEPTH	CRANIAL BREADTH	MASTOIDAL BREADTH	CONDYLOBASAL LENGTH	BASAL LENGTH	MAXILLARY TOOTHROW	BREADTH AT M^3	BREADTH AT CANINES	MANDIBULAR TOOTHROW
CNHM 48560 ♂	Bogotá, Colombia	20.7	11.6	3.9	–	9.3	10.4	18.8	–	7.8	8.5	4.7	8.5
CNHM 68561 ♀	Cuzco, Peru	20.8	11.7	3.6	7.5	9.5	10.9	19.1	17.3	7.8	8.4	4.8	8.9
TCWC 6573 ♂	Tamaulipas, México	21.2	11.9	3.7	7.3	9.5	11.3	20.0	18.2	8.2	8.4	4.8	9.4
TCWC 6574 ♂	Tamaulipas, México	21.6	11.7	–	7.1	9.1	10.2	19.9	17.9	8.1	8.1	4.7	9.1
IB 4838 ♂	Tamaulipas, México	21.2	12.0	4.0	7.1	9.7	11.1	19.7	17.8	7.9	8.4	4.6	8.9
IB 4839 ♀	Tamaulipas, México	20.5	11.4	3.7	7.0	9.2	11.0	19.1	17.1	7.8	8.2	4.9	8.8
IB 4841 ♀	Tamaulipas, México	20.7	11.8	3.8	7.2	9.5	11.1	19.1	17.4	7.8	8.6	4.4	9.0

specimens are indistinguishable from either *T. similis* or *T. aurispinosa.*

Shamel (Proc. U.S. Nat. Mus., 78: 1–27, 1931) considered *T. aurispinosa* a synonym of *T. laticaudata.* Sanborn (Field Mus. Nat. Hist., Zool. Ser., 27: 371–387, 1941) named *T. similis* on the basis of one specimen from Bogotá, Colombia, and said that it is a west coast representative of *T. aurispinosa.* Sanborn (Publ. Mus. Hist. Nat. "Javier Prado," Ser. A. Zool., no. 6, 26 pp.,1951) also reported a second specimen of *T. similis* taken with three *T. molossa* in a cave at Huajyumbe, Cuzco, Peru. He defends the recognition of the Colombian and Peruvian specimens as representing a distinct species mainly on the basis that the altitude at Bogotá is high for a tropical bat (*T. aurispinosa*). Since there is no skull for the type of *T. aurispinosa,* Sanborn proposed that the name *T. similis* should be retained at least until more specimens of *T. aurispinosa* were available for study. Now that the five Mexican specimens are available and compare so closely with the type of *T. aurispinosa* and also with the two known specimens of *T. similis,* it is apparent, at least to us, that the two are conspecific and that the name *T. similis* Sanborn should be placed as a synonym of *Tadarida aurispinosa* (Peale). A full synonymy for *T. aurispinosa* is given by Shamel (op. cit., 9–10). *T. aurispinosa* is now known by eight specimens from four localities: Brazil (type, adult male, no. 3726, U.S. Nat. Mus.), Colombia (adult male, No. 48560, Chicago Nat. Hist. Mus.), Peru (adult female, No. 68561, Chicago Nat. Hist. Mus.), and México (two adult males, nos. 6573 and 6574, Texas Cooperative Wildlife Collection; one adult male and two adult females, Nos. 4838, 4839, and 4841, Instituto de Biologia, Universidad Nacional Autónoma de México).

Since the discovery of *T. aurispinosa* in Cueva del Abra constitutes the fifth form of *Tadarida* reported in the literature from that cave, comments on the similarity of three of these forms seems warranted. Villa (op. cit.) found that Goodwin's *T. l. ferruginea* falls within the range of variation of the form he (Villa) recognized as *T. yucatanica.* Dalquest and Hall (U. Kansas Publ. Mus. Nat. Hist., 1: 245–248, 1947) reported that *T. femorosacca* occurs in this same cave. The skull length and basal length of the two specimens collected by Dalquest are 18 mm and 15.0–15.2 mm, respectively. These, the authors state, are less than the minimum given by Shamel (op. cit.) for *T. femorosacca,* but otherwise the specimens agreed with that species. Total length of skull and basal length seem to be two of the three skull measurements that are useful in separating *T. yucatanica* and *T. femorosacca.* The other is the length of the maxillary toothrow, which is slightly greater in *T. femorosacca.* The fact that these two skull measurements in Dalquest's specimens fall within the range of individual variation for *T. yucatanica* from Peten, Guatemala; Yucatán, and Tamaulipas, México and not within that for *T. femorosacca* leads us to believe that Dalquest's two "*T. femorosacca*" from Cueva del Abra are the same as Villa's *T. yucatanica* and Goodwin's *T. l. ferruginea.*

Villa (op. cit.) believes this cave is occupied by large numbers of *T. mexicana* from January to April, but none is known to have been collected there. Of all the *Tadarida* collected there, only two species can be distinguished: *T. yucatanica* (= *T. l. ferruginea* = *T. femorosacca, auct.*) and *T. aurispinosa.*

Although *T. yucatanica* and *T. laticaudata* are very similar, and may in time prove to be conspecific, we prefer to assign all the small *Tadarida* from Cueva del Abra to *T. yucatanica* on geographic grounds. *T. laticaudata* is a South American bat whose geographic range seems to complement that of *T. yucatanica.*

We wish to express our gratitude to Charles O. Handley, U.S. National Museum, for comparing one of the Mexican specimens with the type of *T. aurispinosa*; to Karl F. Koopman, Chicago Natural History Museum, for the loan of the Peruvian specimen; and to Bernardo Villa R., Instituto de Biologia, Universidad Nacional Autónoma de México, for the loan of three Mexican specimens.

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NEW SPECIES OF POLYCHAETE WORMS FROM THE ATLANTIC OCEAN, WITH A REVISION OF THE DORVILLEIDAE

By Marian H. Pettibone
University of New Hampshire

The five new species and four new genera of polychaete worms described herein were obtained from four sources:

1. Two species, a hesionid and a dorvilleid, collected by Pierre Brunel and others in the Gulf of St. Lawrence and found in the collections of polychaetes at the Station de Biologie Marine, Grande-Rivière, Gaspé, Province of Quebec, Canada, where I worked during the summer of 1959.
2. One species of polynoid, collected by Roland L. Wigley and others off Massachusetts and found in the collections of polychaetes at the U.S. Fish and Wildlife Station at Woods Hole, Massachusetts, where I worked during the summer of 1960.
3. One species of polynoid from the Gulf of Mexico, a part of a collection from Seahorse Key, Florida, sent to me by John L. Taylor.
4. One species of hesionid (some 200 specimens) from the Middle Congo, West Africa, found in the mantle cavities of *Tellina* and sent to me by Arthur G. Humes.

In working up the new genus and species of dorvilleid, it seemed advisable to revise the genera of Dorvilleidae by erecting another new genus and re-establishing a third. The types are deposited in the United States National Museum, Smithsonian Institution.

This study was aided by a grant from the National Science Foundation (NSF G-4833).

FAMILY POLYNOIDAE

Phyllosheila, new genus

Type species: P. wigleyi new species.

Diagnosis: Prostomium with three antennae, with lateral antennae inserted ventrally, without cephalic peaks. Elytra 15 pairs, inserted on segments 2, 4, 5, 7, 9, . . . 21, 23, 26, 29, 32. Segments less than 50. Parapodia biramous. Notosetae stouter than neurosetae, faintly spinous. Neurosetae smooth, bidentate. Ventral cirri enlarged, leaf-like. Ventral surface densely papillated.

Phyllosheila wigleyi, new species

Fig. 1

The species is based on a single specimen (USNM Cat. No. 30007) collected on muddy bottom south of Marthas Vineyard, Massachusetts, *Delaware* cruise No. 59-10, Station 17, 39° 44′ N, 70° 53′ W, 870–970 fathoms, 28 August 1959, R. Fritz, collector. The specimen was snuggled along the ambulacral groove of a large starfish, *Brisinga* sp. The species is named for Roland L. Wigley, who is carrying on interesting benthic studies in the Georges Bank area.

Description: Length 12 mm, width with setae 3 mm, segments 45 (last three small). Body without color, flattened dorsoventrally, tapered gradually posteriorly. Prostomium (Fig. 1, a,b) wider than long, bilobed, rounded anteriorly, lacking cephalic peaks. Median antenna with ceratophore inserted in anterior median notch, with style short, smooth, clavate, with filiform tip. Lateral antennae with short ceratophores inserted ventrally, with short styles. Palps smooth, long (about three times length of prostomium), tapering to short slender tips. Two pairs eyes very large, contiguous, occupying nearly all the lateral surfaces, darker around the periphery, greyish within.

Cirrophores of tentacular cirri lateral to prostomium. Dorsal pair tentacular cirri missing; ventral pair similar to median antenna, only longer. Elytra missing, 15 pairs, as indicated by the elytrophores. Dorsal cirri mostly missing, the few remaining ones cylindrical, with short filiform tip, not extending beyond the setae (Fig. 1, c). Ventral cirri of first setigerous segment (buccal cirri of segment 2) similar to median antenna; from second setigerous segment on, ventral cirri large, leaf-like, tapering laterally to rounded or slightly pointed tips (Fig. 1, b,d,e). Ventral cirri densely papillated on ventral surface; papillae long, slender, longer toward lateral tips of cirri (Fig. 1, f). Ventral surface of papapodia densely covered with larger papillae (Fig. 1, d,g).

Parapodia biramous (Fig. 1, d,e). Notopodia shorter than neuropodia, with projecting acicular lobes and spreading bundles of relatively few (about 6–10), stout, crystal clear setae. Notosetae about twice as thick as neurosetae, with faint spinous markings, tapering to blunt tips (some may be slightly irregular; Fig. 1, h). Neuropodia with bluntly conical presetal and postsetal lips, with a fan-shaped bundle of very numerous

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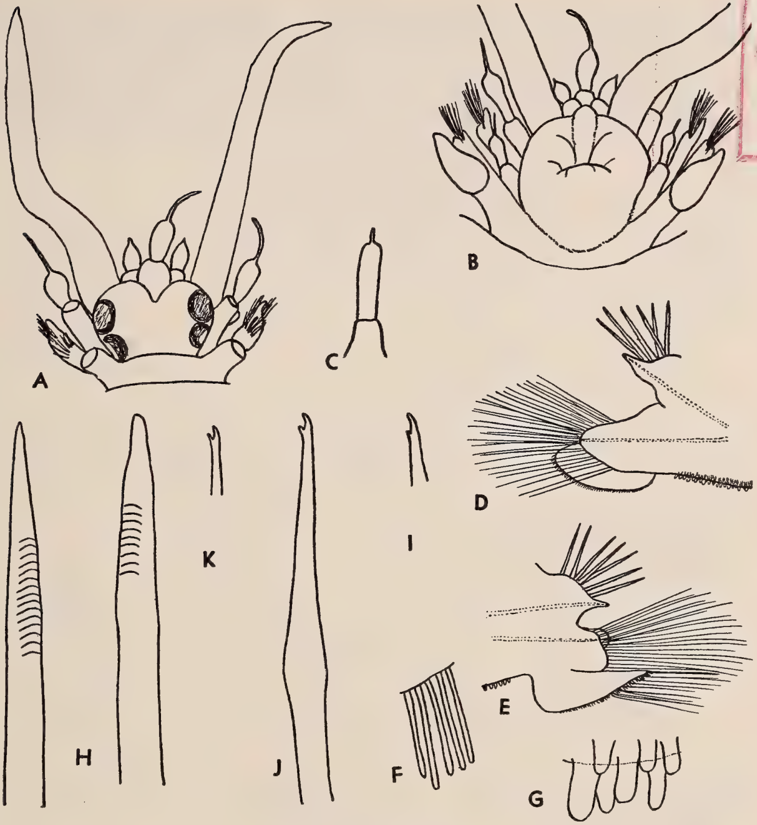

FIG. 1. *Phyllosheila wigleyi* new species: *a*, Dorsal view anterior end (dorsal pair tentacular cirri and elytra missing); *b*, ventral view anterior end (bases of palps only shown); *c*, dorsal cirrus from posterior region; *d*, middle parapodium, anterior view; *e*, same, posterior view; *f*, few papillae from ventral surface of ventral cirri; *g*, few papillae from ventral surface of parapodia; *h*, notosetae; *i–k*, tips of upper, middle and lower neurosetae.

crystal clear setae, suggesting superficially the setal bundles of a heteronereid. Neurosetae with slender stem regions, enlarging distally, then tapering to bidentate hooked tips, without spinous markings (Fig. 1, i–k).

Distribution: Known only from the type locality.

Remarks: Phyllosheila differs from other genera of polynoids in the enlarged ventral cirri, suggestive of the Phyllodocidae. *Gastrolepidia* Schmarda, 1861, and *Phyllohartmania* new genus (see below) are characterized by conspicuous paired ventral foliaceous appendages but the latter are present in addition to and medial to the usual type of ventral cirri.

Phyllosheila wigleyi resembles the bathypelagic polynoid, *Sheila bathypelagica* Monro, 1930, from the Antarctic, in regard to the very large eyes, the glassy and transparent setae, and the general shape of the neurosetae.

Phyllohartmania, new genus

Type species: P. taylori new species.

Diagnosis: Prostomium harmothoid, with distinct cephalic peaks and

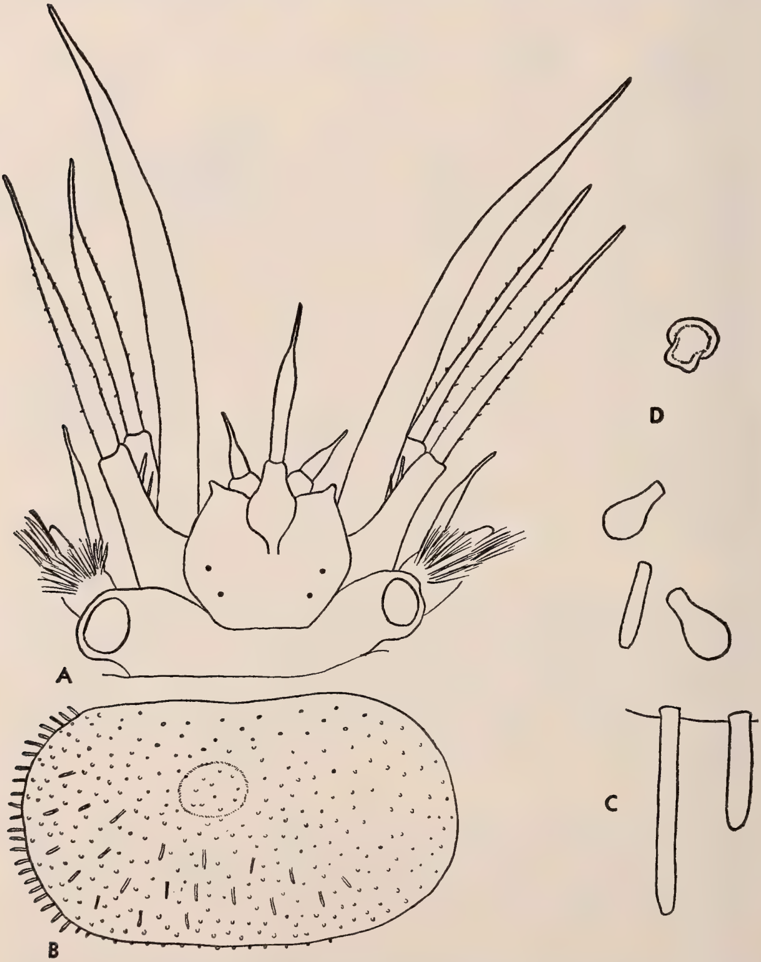

FIG. 2. *Phyllohartmania taylori* new species: *a*, Dorsal view anterior end, elytra removed; *b*, elytron; *c*, few papillae from elytron; *d*, microtubercle from anterior part of elytron.

lateral antennae inserted ventral to median antenna. Elytra 15 pairs, inserted on segments 2, 4, 5, 7, 9, . . . 21, 23, 26, 29, 32. Elytra large, covering the dorsum. Segments less than 40. Parapodia biramous. Notosetae more slender than neurosetae, faintly spinous, tapering to capillary tips. Neurosetae spinous, tapering to slender sharp tips (not hooked). Ventral surface with paired segmental foliaceous appendages.

Phyllohartmania taylori, new species

Figs. 2 and 3

The species is based on a single specimen (USNM Cat. No. 30010) collected at low water, in sand, at Bird Point, Seahorse Key, Florida, in

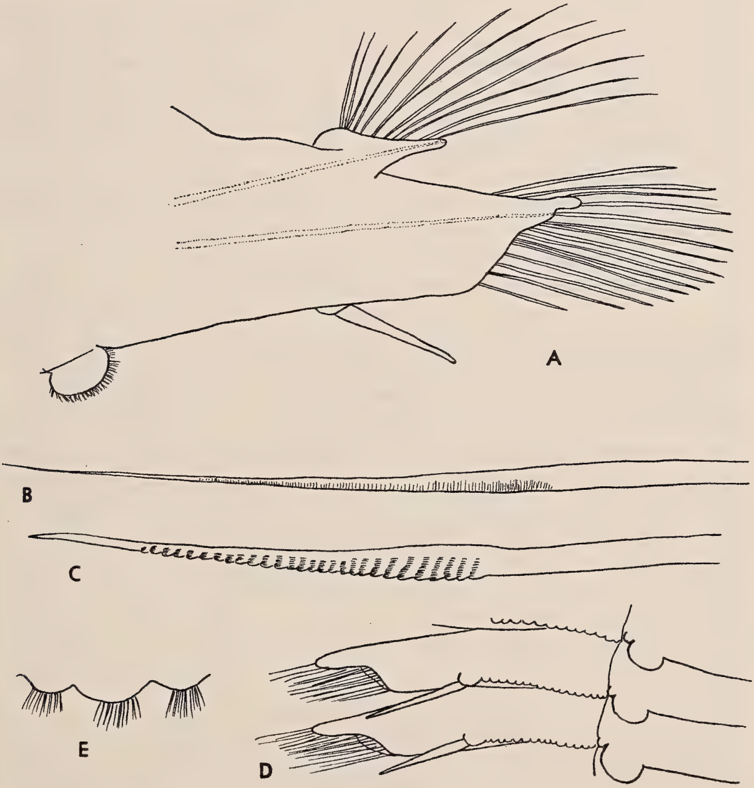

FIG. 3. *Phyllohartmania taylori* new species: *a*, Middle left parapodium and ventral ciliated lamella at base of parapodium, anterior view; *b*, notoseta from same; *c*, middle neuroseta from same; *d*, ventral view of portion of right half of body showing position of ventral lamellae, segmental papillae, papillated ciliated ridges, ventral cirri, parapodia 13 and 14; *e*, portion of ciliated papillated ridge.

the Gulf of Mexico by E. Lowe Pierce, 20 July 1958. The species is named for John L. Taylor, who is working on the polychaetes from Seahorse Key.

Description: Length 21 mm, width with setae 8 mm, segments 37 (last one small). Body widest in the middle third, tapering anteriorly and posteriorly, flattened dorsoventrally. Body iridescent tannish in color, setae yellowish. Elytra 15 pairs, rather large, imbricated, covering the dorsum, oval to subreniform in shape, colorless, thin, transparent. Exposed part of elytra (Fig. 2, b,c) papillate, with papillae of two kinds: 1) slender, filiform, on external border and scattered on surface; 2) short, capitate, on posterior border and scattered on surface. Anterior part of elytra with few scattered microtubercles (Fig. 2, d).

Prostomium (Fig. 2, a) about as wide as long, bilobed, with distinct cephalic peaks. Median antenna with bulbous ceratophore inserted in anterior notch, with style about as long as prostomium, smooth, tapering to filiform tip. Lateral antenna with short bulbous ceratophores inserted ventral to median antenna on prostomium, with short styles. Palps smooth, long, extending beyond tentacular cirri, tapering to slender tips. Two pairs of small eyes on posterior half of prostomium.

Cirrophores of tentacular cirri lateral to prostomium, with projecting aciculum and single stout seta. Two pairs tentacular cirri subequal in length, longer than median antenna, tapering to slender tips, with scattered short papillae. Dorsal cirri with cirrophores bulbous basally; styles long, slender, tapering to slender tips and extending beyond tips of setae, with scattered, short, slightly capitate papillae. Ventral cirri short, slender, tapering. Pair of long slender anal cirri, longer than dorsal cirri.

Parapodia biramous, long, slender, as long as body width (Fig. 3, a). Notopodium shorter than neuropodium, tapering to prominent acicular lobe. Notosetae numerous, forming a radiating bundle, fine, more slender than neurosetae, tapering to capillary tips; upper notosetae stouter and shorter, the rest more slender basally, tapering to longer capillary tips (Fig. 3, b). Neuropodium diagonally truncate distally, with prominent acicular lobe and projecting supraacicular digitiform lobe. Neurosetae basally with long shafts of uniform width, with enlarged distal spinous regions of prominent spinous rows, tapering to slender pointed tips (not hooked); upper neurosetae more slender, with spinous rows extending to near the tips; middle neurosetae (Fig. 3, c) with long bare tips; lower neurosetae shorter, with long bare tips.

Ventral posterior border of parapodia, between cirrophores of ventral cirri and body proper, with tufts of long cilia on a papillated ridge (Fig. 3, d,e). Ventral surface with paired lamellae at base of parapodia, beginning on setigerous segment 3 and continuing posteriorly; lamellae semicircular, equipped with long cilia (Fig. 3, a,d). Segmental papillae (Fig. 3, d) short, globular, inconspicuous, lateral to ventral lamellae, beginning on segment 7, continuing posteriorly. Proboscis of usual polynoid type, with two pairs of interlocking jaws and eleven pairs of papillae around opening, some papillae splotched with black pigment.

Distribution: Known only from the type locality.

Remarks: Phyllohartmania resembles *Hartmania* Pettibone, 1955, in most respects. It differs in the presence of the paired foliaceous appendages on the ventral surface, similar in position to the ventral lamellae characteristic of *Gastrolepidia* Schmarda, 1861.

Phyllohartmania taylori resembles *Hartmania moorei* Pettibone, 1955, in regard to the small eyes, the capillary notosetae, the neurosetae ending in slender sharp tips. It differs in the presence of the paired ventral lamellae (lacking on *H. moorei*) and elytra with papillae (elytra smooth in *H. moorei*).

FAMILY HESIONIDAE

Parasyllidea, new genus

Type species: Parasyllidea humesi new species.

Diagnosis: Prostomium with two antennae (without median antenna), two biarticulate palps. Tentacular cirri six pairs (three pairs on each side). Parapodia subbiramous. Notopodia indistinct, represented by acicula in elongate cirriphores of dorsal cirri, with or without few capillary notosetae. Neuropodia conical (without extra lobes, as in *Nereimyra*). Neurosetae compound, heterogomph, with blades short to long. Proboscis unarmed, with fine hairs around opening.

Parasyllidea humesi, new species

Fig. 4

The species is based on some 200 specimens (USNM Cat No. 30011, holotype, and 30012), collected at Loango, 19 kilometers north of Point Noire, Middle Congo, West Africa, 27 April 1955, by Arthur G. Humes. They were found in the mantle cavities of *Tellina nymphalis* Lamark. The bivalves were found intertidally in muddy sand in estuarine regions, in the vicinity of mangrove swamps where fresh-water streams entered the ocean. Only one hesionid was found in a bivalve. While hesionids, like polynoids, are rather frequently commensalistic, to my knowledge, this is the first record of a hesionid in the mantle cavity of a bivalve. The species is named for Dr. Humes, who collected the specimens.

Description: Length up to 25 mm, width up to 5 mm, segments up to 74. Body relatively short, widest in anterior two-thirds, tapering posteriorly, flattened ventrally, arched dorsally. Color (in life): Light orange to tan with intestine dark reddish brown; (preserved): Cream to yellowish with amber-colored neurosetae. Prostomium (Fig. 4, a,b) subrectangular, wider than long, with a median ridge which disappears when pharynx is extended, with two pairs of black eyes, the anterior pair larger than the posterior pair; lateral antennae and biarticulate palps on anterior margin of prostomium subequal in length, about as long as prostomium, the palps lateral and slightly ventral to antennae.

Tentacular cirri with cylindrical basal cirrophores, three pairs on each side, first pair lateral to prostomium, next two pairs lateral and posterior to prostomium, with 1–2 tentacular segments distinct dorsally; styles of

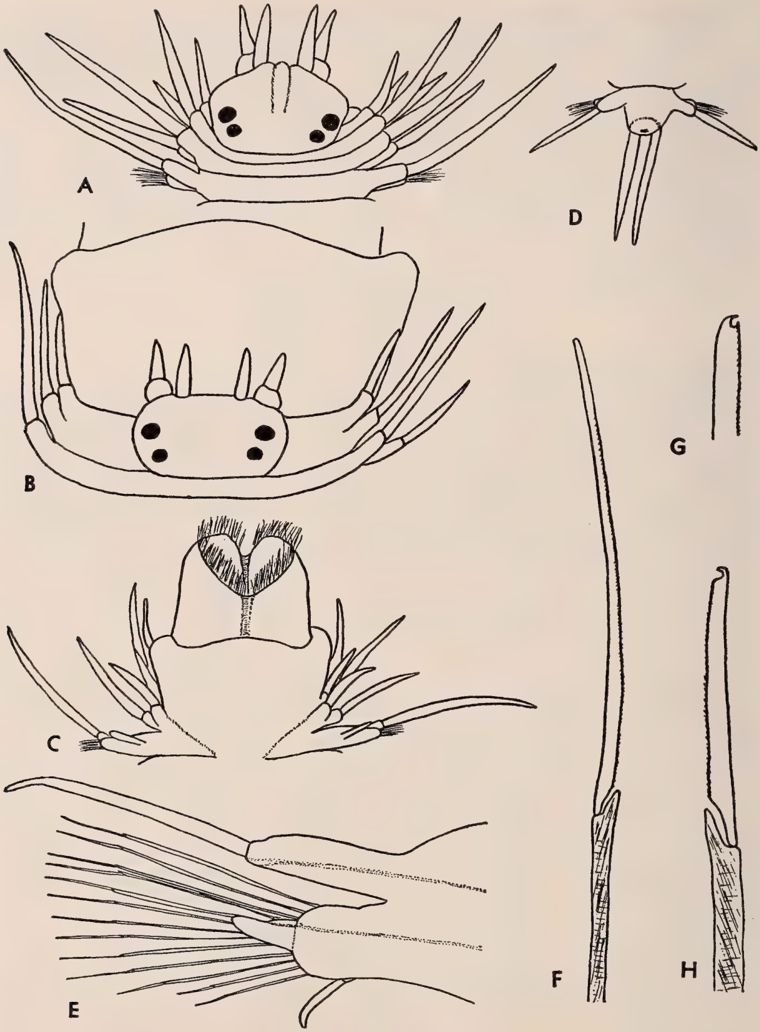

FIG. 4. *Parasyllidea humesi* new species: *a*, Dorsal view anterior end; *b*, same, with pharynx extended, basal part of pharynx only shown; *c*, ventral view anterior end with pharynx extended; *d*, dorsal view posterior end; *e*, middle right parapodium, anterior view; *f*, middle neuroseta; *g*, tip of same, enlarged; *h*, lower neuroseta.

tentacular cirri slender, tapering, upper pairs longer than lower pairs, all shorter than dorsal cirri.

Parapodia (Fig. 4, e) prominent, about as long as width of body, subbiramous, the notopodia represented by few slender curved acicula within the prominent, elongated dorsal cirrophores, without notosetae; styles of dorsal cirri tapering gradually, extending slightly beyond setal tips. Neuropodia elongated, subconical, postsetal lip rounded, presetal lip extending beyond tips of acicula into a digitiform acicular lobe, with 1–2 acicula which are dark amber-colored distally. Neurosetae (Fig. 4, f–h) numerous, forming fan-shaped bundles, light to dark amber-colored, compound, with heterogomph stems, with blades finely pectinate and tips blunt, hooked (may be finely bidentate); middle neurosetae with long blades, upper neurosetae with slightly shorter blades and lower neurosetae with still shorter blades. Ventral cirri slender, digitiform, extending to about length of acicular lobes. Anal end (Fig. 4, d) rounded, with pair of anal cirri slightly longer than the dorsal cirri. Pharynx or proboscis (Fig. 4, c) thick, muscular, with wider basal part and narrower distal ring which is thinner middorsally and midventrally. Opening of pharynx encircled by ring of very fine filmy hairs, without jaws. Some specimens were filled with developing eggs or sperm.

Distribution: Known only from the type locality.

Remarks: Parasyllidea resembles the hesionid genera *Nereimyra* Blainville, 1828 (= *Castalia* Savigny, 1820, preoccupied), *Syllidea* Quatrefages, 1865 (= *Magalia* Marion and Bobretzky, 1875), *Micropodarke* Okuda, 1938, and *Parahesione* Pettibone, 1956, in having two antennae (no median antenna) and two palps on the prostomium and six pairs of tentacular cirri. The five genera can be distinguished as indicated in the following key:

KEY TO THE HESIONID GENERA WITH TWO ANTENNAE, TWO PALPS, AND SIX PAIRS TENTACULAR CIRRI

1.—Parapodia biramous or subbiramous 2
  Parapodia uniramous. Without notoacicula. Neuropodia with bilobed presetal lips and rounded postsetal lips. Proboscis unarmed, with filiform papillae .... *Micropodarke* Okuda

2.—Parapodia subbiramous. Notopodia represented by acicula in cirrophores of dorsal cirri, with or without few capillary notosetae 3
  Parapodia biramous. Notopodia form distinct lobes, smaller than or subequal to neuropodia, with notoacicula and numerous capillary notosetae. Neuropodia subconical, without extra lobes. Proboscis unarmed, with numerous fine papillae .... *Parahesione* Pettibone

3.—Neuropodia subconical, without extra lobes 4
  Neuropodia with three conical lobes. Proboscis with ten or more papillae, with or without pair of ventrolateral ridges .... *Nereimyra* Blainville (= *Castalia* Savigny)

4.—Proboscis bordered with papillae and hairs, with two lateral horny jaws and median stylet .... *Syllidea* Quatrefages (= *Magalia* Marion and Bobretzky)
Proboscis without papillae, with fine hairs around opening, without jaws .... *Parasyllidea* new genus

According to the above revision, *Nereimyra blacki* Knox, 1960, dredged off New Zealand, is referred to *Parasyllidea*. *Parasyllidea humesi* is close to *P. blacki*. The latter lacks eyes (two pairs in *P. humesi*) and has about six capillary notosetae projecting from the dorsal cirrophores (notosetae lacking in *P. humesi*).

Genus *Parahesione* Pettibone, 1956, emended

Type species (original designation): *P. luteola* (Webster, 1880).

Diagnosis: Prostomium with two lateral antennae, without median antenna, with two unjointed (typically) or biarticulate palps, two pairs eyes (typically) or eyes lacking. Tentacular segments three, somewhat fused; tentacular cirri six pairs (three pairs on each side). Parapodia biramous. Notopodia forming distinct lobes below cirrophores of dorsal cirri (typically) or notopodia subequal to neuropodia, with numerous capillary notosetae. Neurosetae compound, with blades long and slender. Proboscis with numerous papillae around opening, without jaws.

Parahesione bruneli, new species

Fig. 5

The species is known from a single incomplete specimen (USNM Cat. No. 30009), dredged on muddy bottom in the Gulf of St. Lawrence, 10 miles off Grande-Rivière, Gaspé South, 48° 18′ N, 64° 18′ W, 60 fathoms, 16 July 1959. It is named for Pierre Brunel, who collected the specimen.

Description: Length for 22 segments 7 mm, width including setae up to 3 mm. Body widest in middle, tapering gradually anteriorly (incomplete posteriorly), flattened dorsoventrally. With wide brownish bands dorsally (in life), colorless (preserved). Prostomium (Fig. 5, a) subrectangular, wider than long, with lateral antennae digitiform, about as long as prostomium, with palps slightly shorter, thicker than and lateral to antennae, distinctly biarticulate, with eyes and median antenna lacking. First tentacular segment indistinct dorsally, cirrophores of the first pairs tentacular cirri lateral to prostomium. Second and third tentacular segments distinct dorsally. Tentacular cirri six pairs, variable in length (easily broken), some long, the upper pairs longer than lower pairs.

Parapodia biramous (Fig. 5, b), with both notopodia and neuropodia well developed, subequal, both with projecting acicular lobes from which 2–3 transparent acicula may project. Both notosetae and neurosetae numerous, arranged in radiating bundles, slender, subequal in diameter basally (some neurosetae slightly stouter than the notosetae), transparent,

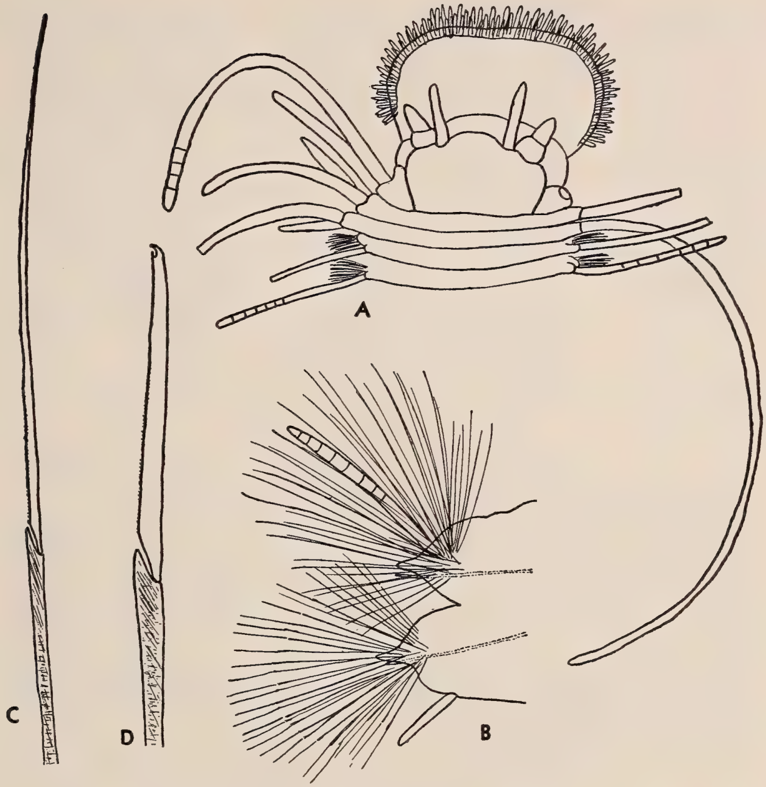

FIG. 5. *Parahesione bruneli* new species: *a,* Dorsal view anterior end, with proboscis extended, first right pair tentacular cirri missing and some of dorsal and tentacular cirri broken; *b,* right parapodium from segment 15, anterior view; *c,* compound neuroseta with long blade; *d,* same, with shorter blade.

iridescent, transversely striated microscopically. Notosetae simple, tapering to capillary tips. Neurosetae (Fig. 5, c,d) compound, finely spinous, the majority with blades long, tapering to fine tips; some of lower neurosetae with blades shorter, with tips hooked, faintly bidentate. Dorsal cirri on posterior faces of notopodia, slender, tapering, sometimes articulate, especially distally, variable in length (easily broken), at least some extending beyond tips of setae. Ventral cirri digitiform, extending slightly beyond parapodial lobes. Proboscis (Fig. 5, a) somewhat flared distally, with numerous papillae around opening, arranged in about 4–5 rows, the papillae tapering to pointed tips.

Distribution: Known only from the type locality.

Remarks: Parahesione bruneli differs from *P. luteola* (Webster) in the following:

	Parahesione luteola	*Parahesione bruneli*
Prostomial eyes:	Two pairs.	Lacking.
Prostomial palps:	Without distinct basal articles.	Distinctly biarticulate.
Three tentacular segments:	One visible dorsally.	Two visible dorsally.
Notopodia:	Smaller than neuropodia, appearing as stout papillae below bases of dorsal cirri.	Subequal to neuropodia.

Family DORVILLEIDAE

Protodorvillea, new genus

Type species: Staurocephalus kefersteini McIntosh, 1869.

Diagnosis: Prostomium with two short dorsal antennae (antennae rarely absent, as in *P. atlantica*), two longer ventral palps. Without nuchal papilla. Parapodia uniramous, without dorsal cirrophores or notoacicula. Dorsal and ventral cirri short, ovoid (dorsal cirri rarely lacking, as in *P. gaspeensis*). Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae four longitudinal rows of numerous denticled plates (two rows on each side).

Protodorvillea gaspeensis, new species

Fig. 6

The species is known from a single incomplete specimen (USNM Cat. No. 30008), collected intertidally among rocks and algae in the Gulf of St. Lawrence at Grande-Rivière, Gaspé South, 2 December 1955, by Pierre Brunel.

Description: Length more than 7 mm (incomplete posteriorly), width up to 0.5 mm, segments more than 27. Body slender, threadlike, having general appearance of a syllid, such as *Exogone,* without color (in alcohol). Prostomium (Fig. 6, a,b) subconical, with faint transverse groove, without eyes, with two short clavate dorsal antennae and two short biarticulate ventral palps. First two tentacular segments apodous and achaetous, first slightly longer than following. Dark mandibles (Fig. 6, b,c) visible ventrally through thin integument, wider, flared, and denticled anteriorly. Dark maxillae visible more dorsally (not dissected out).

Parapodia (Fig. 6, d) uniramous, with single neuroaciculum, without indication of dorsal cirrophores, notoacicula or dorsal cirri. Neuropodia cylindrical. Ventral cirri short, cylindrical. Neurosetae of three kinds: (1) upper ones (1–2 in number, Fig. 6, d,e) simple, slender, arched,

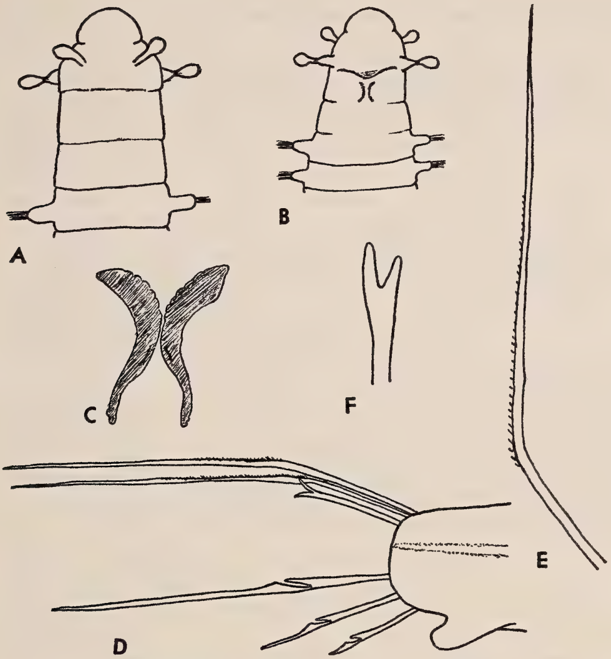

FIG. 6. *Protodorvillea gaspeensis* new species: *a*, Dorsal view anterior end; *b*, ventral view anterior end; *c*, ventral mandibles as seen through the integument; *d*, middle parapodium; *e*, upper simple capillary neuroseta; *f*, upper simple forked neuroseta; *g*, upper subacicular compound neuroseta; *h*, lower subacicular compound neuroseta.

finely spinous; (2) upper one (1 in number, Fig. 6, f) simple, forked, with branches smooth, nearly equal; (3) subacicular ones (3–4 in number, Fig. 6, g,h) compound, heterogomph, with blades long to short, finely spinous, with tips entire, slightly hooked; stems with few spines distally. The single specimen found in December contained very large yolky eggs, beginning in setigerous segment 11, about 2–3 eggs per segment.

Distribution: Known only from type locality.

Remarks: Protodorvillea, as herein defined, includes the following species:

P. kefersteini (McIntosh, 1869), *P. atlantica* (McIntosh, 1885), *P. egena* (Ehlers, 1913), *P. gracilis* (Hartman, 1938), and *P. mandapamae* (Banse, 1959).

Protodorvillea gaspeensis differs from the other species of *Protodorvillea* by lacking dorsal cirri and by having short biarticulate palps. The distinguishing characters of the different species of *Protodorvillea* are indicated in the following key:

KEY TO THE KNOWN SPECIES OF *PROTODORVILLEA*

1.—Antennae lacking. Without eyes. Palps long, with distal palpostyles. Dorsal cirri lacking on first setiger. Neuropodia without postsetal lobes. Blades of compound neurosetae with tips entire. .... *P. atlantica* (McIntosh)
(Atlantic, off Azores, 1,000 fathoms)

Antennae present 2

2.—Dorsal cirri lacking on all segments. Palps short, biarticulate. Antennae short, clavate. Without eyes. Neuropodia without postsetal lobes. Blades of compound neurosetae with tips entire, slightly hooked. .... *P. gaspeensis* new species
(Gulf of St. Lawrence, low water)

Dorsal cirri present, short, ovoid or conical. Palps long, with distal palpostyles 3

3.—Dorsal cirri lacking on first setiger. Neuropodia with postsetal lobes. Antennae short, clavate. Four eyes 4

Dorsal cirri present on first setiger. Two eyes. Blades of compound neurosetae with tips bidentate, hooked 5

4.—Blades of compound neurosetae with tips bidentate, hooked .... *P. mandapamae* (Banse)
(South India, Gulf of Mannar, low water)

Blades of compound neurosetae with tips entire .... *P. egena* (Ehlers)
(South Africa)

5.—Neuropodia with postsetal lobes. Antennae rather short, indistinctly articled .... *P. kefersteini* (McIntosh)
(Scotland, low water)

Neuropodia without postsetal lobes. Antennae short, clavate .... *P. gracilis* (Hartman)
(Central California, low water)

Revision of the Family Dorvilleidae Chamberlin, 1919
(Staurocephalidae Kinberg, 1865; Stauronereidae Verrill, 1900)

The family Dorvilleidae is usually recognized through two genera, *Dorvillea* Parfitt and *Ophryotrocha* Claparède and Mecznikow. *Dorvillea* has included a heterogeneous grouping of species. Crossland (1924) and Hartman (1944) have indicated some of the characters that could be used in separating the dorvilleid species. They, as well as others, have hesitated to establish different genera, since a number of species are poorly known and inadequately described. The species of *Dorvillea sensu lata* have herein been separated into four genera, *Dorvillea* Parfitt, *Stauronereis* Verrill, *Papilliodorvillea* new genus and *Protodorvillea.* The revision has been based mainly on external characters. The mandibles and maxillae have not been used in separating the genera, since the species are characteristically very small, making it extremely difficult to dissect out the jaw pieces and describe them adequately. Synonymies and diagnoses for the five genera of the Dorvilleidae are given below.

The better known species of dorvilleids are referred to the appropriate genera.

Genus *Ophryotrocha* Claparède and Mecznikow, 1869

Type species: O. puerilis Claparède and Mecznikow, 1869 (monotypy).

Paractius Levinsen, 1879. *Type species: P. littoralis* Levinsen, 1879 (monotypy).

Eteonopsis Esmark, 1874. *Type species: E. geryonicola* Esmark, 1874 (monotypy).

Diagnosis: Prostomium with four similar small papilla-like appendages, two dorsal antennae and two ventral palps. Without nuchal papilla. Parapodia uniramous, without dorsal cirrophores and notoacicula. Dorsal and ventral cirri small lobes. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles two elongated pieces, flared and denticled anteriorly. Maxillae consisting of two sets of relatively few denticled pieces.

Ophryotrocha includes the following species: *O. puerilis* Claparède and Mecznikow, 1869, *O. geryonicola* (Esmark, 1874), *O. claparedii* Studer, 1878, *O. littoralis* (Levinsen, 1879), and *O. minuta* Levi, 1954.

Genus *Protodorvillea*

See above (p. 178).

Genus *Stauronereis* Verrill, 1900

Type species: Nereis rudolphi Delle Chiaje, 1828 (original designation).

Prionognathus Keferstein, 1862 (preoccupied by Laferté, 1851, in Coleoptera). *Type species: P. ciliata* Keferstein, 1862 (monotypy); = *Stauronereis rudolphi* (Delle Chiaje, 1828).

Diagnosis: Prostomium with two long antennae, two long palps. Without nuchal papilla. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of numerous denticled plates (two rows on each side).

Stauronereis includes the following species: *S. rudolphi* (Delle Chiaje, 1828), *S. incertus* (Schmarda, 1861), *S. caecus* (Webster and Benedict, 1884), *S. neglectus* (Fauvel, 1923), *S. japonicus* (Annenkova, 1937), and *S. furcatus* (Hartman, 1953).

Genus *Papilliodorvillea* new genus

Type species: Staurocephalus (Dorvillea) gardineri Crossland, 1924.

Anisoceras Grube, 1856 (preoccupied by Dejean, 1833, in Coleoptera). *Type species* (here designated): *A. rubra* Grube, 1856.

Diagnosis: Prostomium with two long antennae, two long palps. With nuchal papilla. First tentacular segment enlarged, nearly encircling prostomium. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of numerous denticled plates (two rows on each side).

Papilliodorvillea includes the following species: *P. rubra* (Grube, 1856), *P. australiensis* (McIntosh, 1885), *P. crassa* (Chamberlin, 1919), and *P. gardineri* (Crossland, 1924).

Genus *Dorvillea* Parfitt, 1866

Type species: D. lobata Parfitt, 1866 (monotypy); = *D. rubrovittata* (Grube, 1855).

Staurocephalus Grube, 1855 (preoccupied by Barrande, 1846, in Crustacea). *Type species: S. rubrovittatus* Grube, 1855 (monotypy).

Teleonereis Verrill, 1900. *Type species: Staurocephalus rubrovittatus* Grube, 1855 (original designation).

Stauroceps Verrill, 1900. *Type species: Staurocephalus erucaeformis* Malmgren, 1865 (original designation); = *D. rubrovittata* (Grube, 1855).

Diagnosis: Prostomium with two long antennae, two long palps. Without nuchal papilla. First tentacular segment about twice as long as following segment, partly surrounding prostomium. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of denticled plates (two rows on each side).

Dorvillea contains the following species: *D. rubrovittata* (Grube, 1855), *D. vittata* (Grube, 1856), *D. sociabilis* (Webster, 1879), *D. cerasina* (Ehlers, 1901), *D. moniloceras* (Moore, 1909), *D. romeri* (Augener, 1912), *D. angolana* (Augener, 1918), *D. similis* (Crossland, 1924), *D. pseudorubrovittata* Berkeley, 1927, and *D. matsushimaensis* (Okuda, 1954).

The differences among the dorvilleid genera may be summarized in the following key:

KEY TO THE KNOWN GENERA OF DORVILLEIDAE

1.—Parapodia uniramous, without elongate dorsal cirrophores and notoacicula 2

Parapodia subbiramous, with elongate dorsal cirrophores and enclosed notoacicula. Prostomium with two long antennae and two long palps. Maxillae consisting of four longitudinal rows (two on each side), each with numerous denticled plates 3

2.—Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Prostomium with four similar small papilla-like appendages, two dorsal antennae and two ventral palps. Maxillae consisting of two series of plates, each consisting of less than 16 plates .... *Ophryotrocha* Claparède and Mecznikow

Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Prostomium with two short antennae, two palps longer than antennae. Maxillae consisting of four longitudinal rows (two on each side), each with numerous denticled plates .... *Protodorvillea*

3.—Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph .... *Stauronereis* Verrill

Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph 4

4.—With nuchal papilla. First achaetous tentacular segment enlarged, nearly encircling prostomium .... *Papilliodorvillea*

Without nuchal papilla. First achaetous tentacular segment somewhat enlarged, partly encircling prostomium ..*Dorvillea* Parfitt

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THREE NEW SPECIES OF MALLOPHAGA FROM THE GREAT HORNED OWL

By K. C. Emerson
Stillwater, Oklahoma

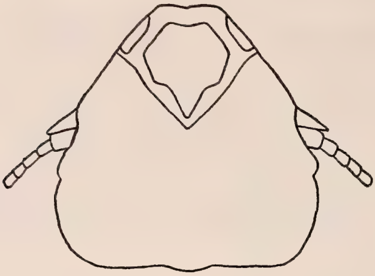
The Mallophaga collection of the U.S. National Museum contains several new species of Mallophaga found on North American owls. Described herewith are three new species found on the Great Horned Owl, *Bubo virginianus* (Gmelin). Heretofore only one species has been described from this host.

Strigiphilus oculatus (Rudow, 1870)

The form with a short, wide, dorsal anterior plate of the forehead as shown in Fig. 1, has generally been accepted as *Strigiphilus oculatus* (Rudow, 1870). The type has not been located, but the first line of Rudow's description "Kopf so lang wie hinten breit" and the specific name leave no doubt as to which form he described. *Strigiphilus bubonis* (Osborn, 1896) is conspecific with this form.

The only other interpretation of S. *oculatus* was that advanced by Carriker in 1958. Carriker noted that at least two and probably three new species of *Strigiphilus* were found on this host. He designated as "neoparatype" of S. *oculatus*, an undescribed female of an unknown species. He reasoned that Rudow described a narrow forehead form because it was placed in the old genus *Nirmus*. He apparently did not consider the name given by Rudow, or the two portions of Rudow's description: "Kopf so lang wie hinten breit" and "Das Thier sieht ganz einem *Docophorus* ähnlich." The present genus *Strigiphilus* was included in *Docophorus* for many years. Carriker's primary reason appears to be the desire to apply the name S. *oculatus* in a manner so that S. *bubonis* would be valid for the broad forehead form.

I think it is unwise to consider any interpretation except the one which has been well established for 88 years, unless the types when located should indicate otherwise. Carriker's action is not accepted for the additional reasons that he did not describe and erect a neotype. Even if this had been done, a neotype has no standing unless accepted by the International Commission on Zoological Nomenclature. I feel that for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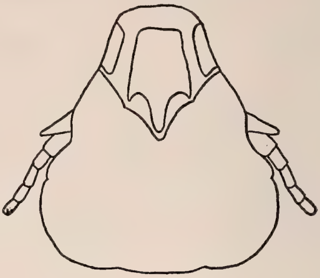
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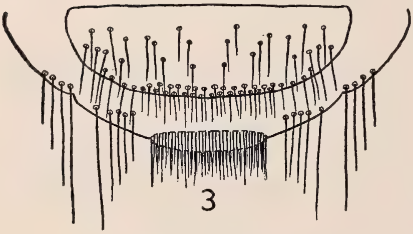
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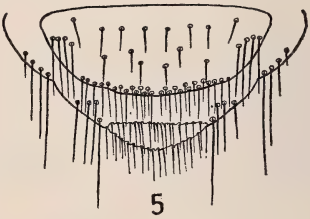
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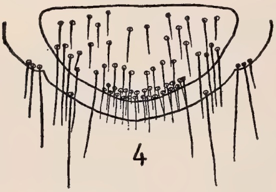
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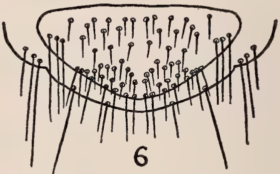
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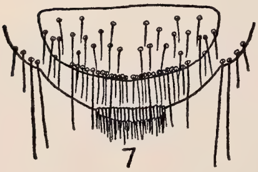
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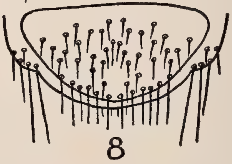
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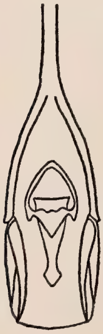
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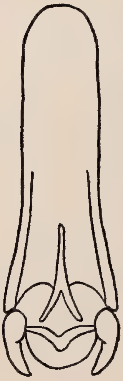
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the reason given, the Commission would reject any attempt to change such a well-established interpretation.

Strigiphilus acutifrons, new species

Holotype male: Shape of head and dorsal anterior plate of forehead as shown in Fig. 2. Pterothorax with dorsal chaetotaxy of 2-3-3-2 long setae. Chaetotaxy of abdominal tergites: II-16, III-20, IV-20, V-20, VI-16, VII-16, and VIII-6. Chaetotaxy of abdominal sternites: II-6, III-14, IV-14, V-14, VI-14, VII-2, and VIII-4. Genital plate narrow and elongated with two long setae located centrally in the anterior portion. Genitalia as shown in Fig. 10.

Allotype female: Essentially same as the male except for size and terminal abdominal segments. Genital plate rectangular-shaped and with only sparsely scattered small setae. Terminal abdominal segment bilobed and ventrally with six long setae laterally on each lobe.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.65	0.70
Width of head	0.57	0.62
Width of prothorax	0.34	0.38
Width of pterothorax	0.51	0.56
Width of abdomen	0.82	0.90
Total length	1.88	2.15

Diagnosis: The most obvious difference between this species and *S. oculatus* is the shape of the dorsal anterior plate of the forehead as illustrated. Abdominal chaetotaxy is more dense in *S. acutifrons* than in *S. oculatus.* The long narrow male genital plate in *S. acutifrons* is distinctive; in *S. oculatus* this structure is triangular-shaped with the widest portion being anterior. There appears to be no significant difference in

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FIGS. 1–10. 1.—*Strigiphilus oculatus* (Rudow, 1870), outline of head, ♂. 2.—*Strigiphilus acutifrons* new species, outline of head, ♂. 3.—*Kurodaia edwardsi* new species, ventral view, terminal abdominal segments, ♀. 4.—*Kurodaia edwardsi* new species, ventral view, terminal abdominal segments, ♂. 5.—*Kurodaia magna* Emerson, 1960, ventral view, terminal abdominal segments, ♀. 6.—*Kurodaia magna* Emerson, 1960, ventral view, terminal abdominal segments, ♂. 7.—*Kurodaia keleri* new species, ventral view, terminal abdominal segments, ♀. 8.—*Kurodaia keleri* new species, ventral view, terminal abdominal segments, ♂. 9.—*Kurodaia keleri* new species, male genitalia. 10.—*Strigiphilus acutifrons* new species, male genitalia. (Figures 1–8 are drawn to the same scale.)

the female genital structures of the two species. The male genitalia are the same type, but smaller than in *S. cursor* (Burmeister, 1838).

Type material: Holotype male (USNM 65485), allotype female, and two paratypes collected in Quebec Province by Father Hubert in December 1956. Nine paratypes collected at Springdale, Oregon on 30 July 1933 by S. G. Jewett; four paratypes collected in 1914 by M. H. Spaulding at Boseman, Montana; two paratypes collected at Uvalde, Texas by D. C. Parman on 27 November 1915; eight paratypes collected at Tillamook, Oregon on 23 November 1930 by Alex Walker; and eight paratypes collected at Corvallis, Oregon on 16 November 1931 by M. F. Conova; all in the U. S. National Museum.

The British Museum (Natural History) has the following paratypes: seven collected in California (no other data); and twelve collected at Thue, Beaver Creek, Saskatchewan, Canada, during 14 October–2 November 1959 by R. Connell.

The University of Saskatchewan has the following paratypes: five collected on 14 October 1959, 19 collected on 2 November 1959, and six collected on 6 November 1959 by R. Connell at Thue, Beaver Creek, Saskatchewan, Canada.

Kurodaia edwardsi, new species

This species is closely related to *K. magna* Emerson, 1960 which was completely illustrated recently; so only significant differences are given. Some specimens of the type series have the expanded preantennal region as commented on in my paper on *K. magna.* There is no doubt that this expansion resulted from the mounting technique employed in all instances.

Holotype male: Chaetotaxy, except for terminal abdominal segments, with two long setae per tergite and sternite less than in *K. magna.* Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 4, that of *K. magna* is shown in Fig. 6. The male genitalia do not appear to be distinctive.

Allotype female: Chaetotaxy, except for terminal abdominal segments, with two long setae per tergite and sternite less than in *K. magna.* Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 3, that of *K. magna* is shown in Fig. 5.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.40	0.44
Width of head	0.69	0.74
Width of prothorax	0.47	0.49
Width of metathorax	0.60	0.67
Width of abdomen	0.99	1.16
Total length	2.09	2.30

These measurements are greater, especially in widths, than for *K. magna*, as may be seen by comparing Figs. 3 and 4 with 5 and 6.

Type material: Holotype male (USNM 65483) and eleven paratypes collected at Nashville, Tennessee on 20 December 1940 by Mrs. A. R. Laskey. Allotype female collected at Church Creek, Maryland on 11 February 1932 by F. R. Smith. Three paratypes collected at Hamilton, New York in December 1946 by R. L. Edwards; two paratypes collected at Hamando, Mississippi on 18 September 1918 by O. G. Babcock; two paratypes collected at Raleigh, North Carolina on 4 February 1931 by C. S. Brimley; two paratypes collected at Jackson, Michigan on 1 June 1930 by W. G. Fargo; three paratypes collected at Brunswick, Maine on 27 October 1926 by A. O. Gross; five paratypes collected at Monton, New York in January 1930 by G. M. Smith; seven paratypes collected at Toronto, Canada on 28 October 1927 by J. L. Baillie; six paratypes collected in Quebec Province in December 1956 by Father Hubert; and 43 paratypes collected at Tillamook, Oregon on 23 November 1930 by Alex Walker; all in the U. S. National Museum.

In the British Museum (Natural History) are the following paratypes: two collected at Thue, Beaver Creek, Saskatchewan, Canada on 7 October 1959 by R. Connell; four collected at Beaver Creek, Saskatchewan, Canada, during December 1958–January 1959 by R. Connell; and two collected at Vancouver, British Columbia, Canada, on 13 February 1948 by G. J. Spencer.

The University of Saskatchewan has the following paratypes: six collected on 7 October 1959, 20 collected on 31 March 1959, and six collected during 23 December 1958–26 January 1959 by R. Connell at Thue, Beaver Creek, Saskatchewan.

This species is named for a coworker in Mallophaga, R. L. Edwards, who collected part of the type series.

Kurodaia keleri, new species

Holotype male: Temples angular as in *K. pectinata* (Osborn, 1902). Dorsally, prothorax with four medium-length setae and eight long setae on posterior margin. Metathorax with dorsal and ventral chaetotaxy as in *K. magna*. Chaetotaxy of abdominal tergites, except terminal, and paratergites same as in *K. magna*. Abdominal sternite I with six medium-length setae; II with 42 medium-length setae in three transverse rows. Each posterior-lateral angle of sternite III with three combs of setae; the two posterior combs with about 14 short setae each, and the anterior comb with five short setae. Chaetotaxy of sternites IV–VII same as in *K. magna*. Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 8. Male genitalia, except for sac, as shown in Fig. 9. Genital sac serrated with stout, short and medium-length teeth.

Allotype female: Essentially same as the male, except for terminal abdominal segments and size. Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 7.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.35	0.38
Width of head	0.55	0.60
Width of prothorax	0.35	0.38
Width of metathorax	0.47	0.54
Width of abdomen	0.62	0.75
Total length	1.71	1.85

Diagnosis: In general shape, this species has a relatively narrow head and abdomen as in *K. pectinata.* The chaetotaxy is more nearly that of *K. magna.* The chaetotaxy of the terminal abdominal segments as illustrated, is distinctive. The male genitalia, also illustrated, are of a type not heretofore encountered in the genus.

Type material: Holotype male (USNM 65484) and allotype female collected in Charlton County, Georgia by Francis Harper during 13–14 December 1935. Twelve paratypes collected at Ocala, Marion County, Florida on 15 August 1956 by C. H. Wharton; two paratypes collected on Oatland Island, Georgia on 12 September 1949; three paratypes collected at Menard, Texas on 2 October 1937 by H. E. Parish; and nine paratypes collected at Carleton, South Carolina on 15 December 1934 by H. S. Peters; all in the U. S. National Museum.

This species is named for Stefan von Keler, the noted German specialist on Mallophaga.

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NEW SCIURAVID RODENTS FROM THE LOWER EOCENE KNIGHT FORMATION OF WESTERN WYOMING

By C. Lewis Gazin[1]
U.S. National Museum

As part of a general study of the mammalian faunas of the Knight formation of western Wyoming, based on more extensive collections than were available at the time of my 1952 report, there are now recognized three distinct genera of sciuravid rodents. Two of these, *Knightomys senior* and *Dawsonomys woodi,* are from the lower Eocene Lost Cabin equivalent beneath the level of the Tipton tongue of the Green River formation; and the third, *Sciuravus wilsoni,* is from the New Fork or Cathedral Bluff equivalent, also of Lost Cabin age, but above the Tipton tongue of the Green River formation.

The diagnoses that follow were abstracted from the more detailed discussion included in the manuscript on the faunas as a whole. They are published separately at the suggestion of Mary Dawson of Smith College, who is reviewing the family Sciuravidae, so that the names of the new genera and species will be available to her more promptly for purposes of comparison and discussion. Illustrations and tables of measurements will be included in the forthcoming more general study of the Knight faunas.

SCIURAVIDAE

Knightomys, new genus

Generic characters: Lower cheek teeth anteroposteriorly short, broad across talonid, and very low-crowned. Cusps low and conical. Talonid basin large but very shallow and trigonid basin scarcely discernible. Except for posterolophid, the transverse lophs are comparatively weak and ill-defined. The mesoconid is clearly defined and there is a distinct hypoconulid. The genus is named for the Knight formation.

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Type species: Tillomys senior Gazin, 1952 (Smithsonian Misc. Coll. 117: 48–49).

Dawsonomys, new genus

Generic characters: Cusps of teeth low, but with metaconid of P_4 high and well forward. Trigonid of M_1 broad and anteroposteriorly compressed, but with small, distinct trigonid basin. Talonid basin large and comparatively shallow. Ectolophid low with distinct mesoconid. Entoconid low and lophid from entoconid low but well defined and joins hypoconid. Posterolophid extends nearly to lingual margin and close to but sharply separated from the crest extending buccally from the entoconid. The genus is named for Mary Dawson in appreciation of her work on sciuravid rodents.

Type species: Dawsonomys woodi new species.

Dawsonomys woodi, new species

Type: Left ramus of mandible with P_4 and M_1, USNM No. 19309. (This specimen was cited as "*Sciuravus,* possibly *S. depressus* Loomis" in 1952.)

Horizon and locality: La Barge faunal horizon (Lost Cabin equivalent) of Knight, 12 miles N of Big Piney, Sublette County, Wyoming.

Specific characters: Size of lower teeth appreciably smaller than in *Sciuravus nitidus.* Specific characters not otherwise distinguished from those cited as characterizing the genus. The species is named for Albert E. Wood in recognition of his work on paramyid rodents.

Sciuravus wilsoni, new species

Type: Right ramus of mandible with P_4–M_2, USNM No. 22425.

Horizon and locality: New Fork faunal horizon (Lost Cabin equivalent), west side of Alkali Creek, near center of T. 29 N, R. 110 W, Sublette Co., Wyoming.

Specific characters: Intermediate in size between *Sciuravus nitidus* and *Sciuravus bridgeri,* close in this respect to *Dawsonomys woodi.* Talonid basins of lower molars smoother and less complicated than in Bridger forms. No trace of a mesolophid or crest from mesoconid and little or no evidence of a metastylid. Teeth in general less progressive in appearance than in *S. nitidus.* The species is named for Robert W. Wilson in recognition of his work on Bridger sciuravids.

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A NEW RACE OF *BUFO VALLICEPS* FROM GUATEMALA

By Edward R. Baylor and L. C. Stuart
Woods Hole Oceanographic Institution and Department of Zoology, University of Michigan

Through a grant provided by the Horace H. Rackham School of Graduate Studies, The University of Michigan, the junior author was able to spend the winter, spring and early summer of 1955 investigating the herpetofauna of the Sierra de los Cuchumatanes of northwestern Guatemala. Extremely dry conditions prevailed throughout this region that year, and the rains, normally anticipated in mid-May, did not break until early June and even these amounted to no more than scattered showers. As a result few amphibians were secured. The junior author was fortunate, however, to be on hand for several showers that fell upon the village of Jacaltenango during the first week of June.

Jacaltenango lies on a terrace of sandstone, high above the Rio Azul, and small depressions in the bed-rock fill rapidly and retain water for a considerable period after showers. In these shallow rain-ponds within the village were encountered breeding choruses of *Smilisca baudini* Dumerit and Bibron, 1841, *Hypopachus championi* Stuart, 1940, and an apparently undescribed race of *Bufo valliceps* Weigmann, 1833. This last it is now our pleasure to describe and to dedicate to our good friend Leonard S. Wilson, Chief, Environmental Sciences Division, O/C R and D, Department of the Army. The new race may be known as

Bufo valliceps wilsoni, new subspecies

Holotype: The University of Michigan, Museum of Zoology 119391. An adult male collected in a rain-pond in Jacaltenango (ca. 50 air-line kilometers northwest of Huehuetenango), Huehuetenango, Guatemala on the night of 6 June 1955. Elevation, ca. 1525 meters. Collector, L. C. Stuart.

Paratopotypes: The University of Michigan, Museum of Zoology, 119354–390, 119392, 23 ♂♂ and 15 ♀♀. Collected by L. C. Stuart from rain-ponds in and around Jacaltenango 6–10 June 1955.

Diagnosis: A *Bufo* of the *valliceps* complex distinguished from other populations of the same by its larger and more ovoid parotoid glands and its very short, stout supratympanic crests (Figs. 1–2).

Description of holotype: Head with a full complement of dorsal head-crests. Prefontal and interorbital crests continuous; flaring laterad and caudad; continuous with the postorbital crests in a gentle curve. Parietal crests directed medially and forming a right angle with the postorbitals. Supratympanic crests short and stout (see below); contained in the length of the parotoid gland almost three times and in the length of the head (see below) almost five and one-half times. Preorbital and postorbital ridges evident but not particularly well developed. Snout to about level of nostrils almost vertical in profile. Upper eyelid shorter than parotoid gland but longer than its distance from the end of the snout. Tympanum vertically ovoid; slightly more than half the length of the upper eyelid; strongly overhung by the supratympanic crest. Parotoid glands longitudinally ovoid, more than half as long as the head length (see below) and almost two-thirds as broad as long. Outer palmar pad about 50 per cent larger than inner. Outer metatarsal tubercle about twice the size of the inner. Toes moderately webbed; toe V webbed to joint of ultimate-penultimate phalanges. A row of inconspicuous, low tubercles extending posteroventrally from parotoids but not reaching groin. A row of differentiated conical tubercles with melanoid apices along ventral, outer edge of tarsus. Dorsum covered with low warts, large intermixed with small. The larger warts without definite apices but with many small melanoid (gland?) openings which number 15–20 on warts of average size but may amount to as many as 50 on the largest ones. Laterally the warts become more uniform in size and lack both melanoid apices and small melanoid (gland?) openings. Ventrum uniformly covered with small warts each with a melanoid apex. Upper surfaces of arms and legs with somewhat larger warts either with single melanoid apices or occasionally with a few secondary melanoid (gland?) openings. Upper and inner lateral surfaces of fingers I and II supporting dark nuptial pads, while only the inner surface of finger III is similarly darkened as is about one-half of each inner palmar tubercle.

The ground color of the head and dorsum (following fixation in formalin and preservation in spirits) is grayish buff. The dorsal surface of the head is without markings except for dark brown fleckings on the ridges of the cranial crests. On the sides of the head the ground color fades ventrad to cream on the upper lip. The back, owing to the melanoid (gland?) openings, has a speckled appearance. A suggestion of a narrow, light mid-dorsal stripe. A poorly defined light streak borders the lateral

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line of warts above and a diffused dark streak forms a lower border. Groin region cream-colored and mottled with gray and black. Upper surfaces of arms and legs cream-colored with irregular, transverse bands of gray or black. Undersurfaces cream-colored with very faint gray mottlings. Parotoids light greenish yellow punctated with tiny, dark brown (gland?) openings.

Head–body length, 63.0 mm; head length (base of parietal crest to tip of snout), 18.3 mm; head width (at jaw angles), 23.0 mm; upper eyelid, 9.1 mm; supratympanic crest (outside length), 3.4 mm; long diameter of tympanum, 4.8 mm; right parotoid gland, 10.1 mm by 6.4 mm; leg (coccyx to distal end of tibia), 45.0 mm; foot (distal end of tibia to tip of toe IV), 36.0 mm.

Variation: Table 1 summarizes variations observed in several populations of *valliceps* with reference to the diagnostic features of *wilsoni*. Comparisons have been confined to males inasmuch as females in the collections studied are too few to permit valid conclusions. It may be noted, however, that females of the paratypic series differ from the males only in having slightly longer supratympanic crests, but this difference is so slight that the figures for the type series as indicated by the males are not appreciably affected. Though the senior author has analyzed these data statistically, they reveal nothing of diagnostic value that is not apparent in the raw data.

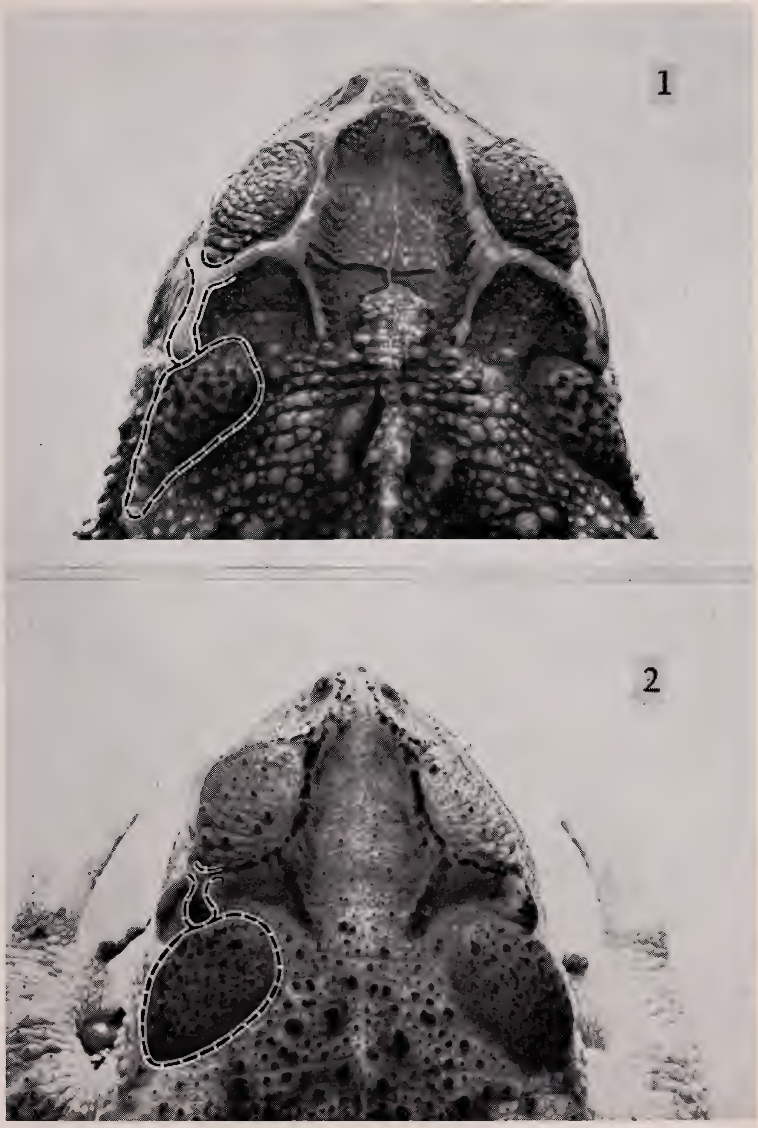
In color and pattern the paratypic series shows considerable variation. Except for the banding on the extremities, all markings may be obliterated owing either to an over-all lightening or to darkening of the ground color which may vary from light brownish cream to very dark brown respectively. The females tend to be much darker than the males. Some individuals are particularly brilliantly marked with dark brown or black blotchings, mottling or reticulations on a light background. This is especially true of the population from the Tuxtla Gutierrez region (Tuxtla Gutierrez and Berriozabal, Chiapas, Mexico). Our colleague, William Duellman, who sampled the latter, informs us that in life these individuals have a light, greenish yellow dorsum with olive markings.

In size, the apparent adults of the paratypic series (males with nuptial pads) vary in head–body length 49.0–64.0 mm in the males and 62.0–76.5 mm in the females. A small male with a head–body length of 41.5 mm displays an early stage of nuptial pad development. Males of the population from the Tuxtla Gutierrez region vary 53.5–69.5 mm head–body length. The largest male I have examined, a specimen from Monte Cristo near Motocintla, Chiapas, Mexico measures 71.5 mm while the largest female, one of what I believe to be an intergrading population between *valliceps* and *wilsoni* from the Monserrat area (ca. 80 kilometers southwest of Ocozocoautla, Chiapas, Mexico), has a head–body length of 93.0 mm.

In addition to the characters analyzed above, the nature of the warts in the differentiated lateral row and the length of the parotoid in relation to the length of the upper eyelid are of some diagnositc value. As generalizations, the lateral row of warts is far less conspicuous and somewhat more broken and shorter in *wilsoni* than in *valliceps,* and the parotoid of the new race tends to be longer than the upper eyelid whereas in *valliceps* it is generally shorter.

Discussion: In a recent paper (Herpetologica 13: 219–221, 1957) Firschein and Smith described *Bufo valliceps macrocristatus* as a population distributed through the foothill region of northern Chiapas, eastern Oaxaca and possibly extreme southern Veracruz, Mexico. Through the courtesy of Hobart Smith the junior author has been privileged to examine the following specimens assigned to that race: two paratopotypes (University of Illinois, Museum of Natural History 11309 and 11311, Palenque, Chiapas), a paratype (UIMNH 35586, La Gloria, near Juchitan, Oaxaca) and a specimen from Cerro Brujo, Chiapas (UIMNH 35764). None of these specimens is in a particularly good state of preservation. All appear to have suffered from desiccation and/or strong formalin fixation. The major diagnostic feature of *macrocristatus* is the extreme hypertrophy of the cranial crests. Other characters include the smaller size of the tympanum which frequently varies with sex and the darker pigmentation of the belly which varies both with size and environment.

Of the paratopotypes UIMNH 11309 appears to me to be typical *valliceps.* Such hypertrophy of the cranial crests as is evident is apparently an artifact caused by tissue shrinkage in the preparotoid region. The second paratopotype, UIMNH 11311, is a moderate-sized female with well hypertrophied crests, an apparent but not necessarily real condition which may also have resulted from preservation. The La Gloria individual is very poorly preserved but does show extreme hypertrophy of the crests. However all three of these paratypes are females and hypertrophy of the crests in large females of *valliceps* is the usual rather than the unusual situation. In fact, allowing for preservation, we do not believe that the hypertrophy exhibited in the above paratypes exceeds to any degree that observed in large, well-preserved *wilsoni* females from the Motocintla region of Chiapas and *valliceps* females from Nicaragua. The Nicaraguan population of *valliceps,* in fact, is characterized by considerable crest hypertrophy. The Cerro Brujo specimen (we assume this to be the well-known plant collecting locality to the south of Ocozocoautla) is a male, and on the basis of parotoid gland and supratympanic crest measurements seems to be close to *wilsoni.* Its locale lies within the area in which *valliceps–wilsoni* intergradation is suggested (see below). In spite of the skepticism with which we view the validity of *macrocristatus* we hesitate to pass judgment on it until more and better materials have been forthcoming. It may be noted, however, that a well-preserved collection of *valliceps* which has recently been secured in the Teapa region of Tabasco, where environmental conditions appear to be identical with those of Palenque, show no approach to the *macrocristatus* condition. Regardless of the status of *macrocristatus,* it is not, on the basis of the paratypes which have been examined, to be confused with *wilsoni.*



Figs. 1–2. Surface of heads of two races of *Bufo valliceps* contrasting the narrow, elongate parotoid and elongate supratympanic crest of *Bufo valliceps valliceps* with the more ovoid parotoid and short, stout supratympanic crest of *Bufo valliceps wilsoni*. 1.—*Bufo valliceps valliceps*, Museum of Zoology, University of Michigan, No. 70396; Uaxactun, El Peten, Guatemala. 2.—*Bufo valliceps wilsoni*, holotype.

From Chiapas and northwestern Guatemala we have had access to a few individuals which have not been included in the above analysis. These include ten specimens, mostly females, from the Motocintla region (Mazapa, Monte Cristo, Chicomuselo, and Porvenir), three adults from the Monserrat region, a single individual from Bochil (northwest of San Cristobal), three from Comitan and a single female from San Pedro Necta (ca. 50 air-line kilometers north and slightly west of Huehuetenango, Guatemala). Of these, the Motocintla and San Pedro specimens are typical *wilsoni,* the Bochil and Comitan individuals apparently *valliceps,* while the Monserrat material may be regarded as *valliceps-wilsoni* intergrades though somewhat close to the latter. The range of this new race may, therefore, be defined as the upper valley of the Rio Grijalva in Chiapas and its headwater valleys in northwestern Guatemala at elevations between 400 and 1,600 meters. In other words, the race appears to be restricted to the western end of the northern Central American subhumid corridor which the junior author has described previously (Contrib. Lab. Vert. Biol., Univ. Michigan, 65, 1954).

In this same corridor to the east of Huehuetenango the *valliceps* complex is replaced by the *coccifer* complex. At Aguacatan the junior author found *ibarrai,* and this has been traced eastward and southward through the Salama Basin and the Sierra de las Minas to southeastern Guatemala where it is replaced at elevations below about 160 meters by *coccifer.* With one exception there has been found in Guatemala no sympatry between the *coccifer* and *valliceps* groups. The single exception was the occurrence of a few individuals of *valliceps* in the little plaza in Esquipulas in southeastern Guatemala. Inasmuch as *coccifer* alone occurred, and in abundance, on the grasslands immediately around Esquipulas, it is conceivable that the few *valliceps* observed within the village may have stemmed from an importation. Esquipulas, it may be noted, is the most important religious shrine in northern Central America where it holds a position comparable to that of Guadalupe in Mexico.

Inasmuch as *ibarrai* and *wilsoni* are superficially very similar in appearance, it may be pointed out at this time that the *coccifer* and *valliceps* groups may be separated easily on the basis of two characters. The snout of *valliceps* is almost vertical in profile and forms a rounded but distinct angle with the surface of the head. In *coccifer* the dorsal surface of the head and the tip of the snout are continuous, forming an uninterrupted arc in profile. A second character is found in the structure of the larger warts of the dorsum and flanks. In the *coccifer* series, even in adult breeding males, the warts are cone-shaped and generally have sharply pointed, melanoid apices. In *valliceps* the warts are more flattened and may or may not support melanoid apices. The warts in the *valliceps* group are covered with melanoid secondary spinules which in the holotypic description of *wilsoni* were defined as possible multiple gland openings. In females, warts of this nature are more localized than in the males and are frequently confined to the anterior parts of the flanks. The difference in the nature of the warts parallels the condition

TABLE 1.—Summary of Analyses of Three Characters in Several Populations of *Bufo valliceps*.*

LOCALITY	PAROTOID GLAND / SUPRATYMPANIC CREST		HEAD LENGTH / PAROTOID GLAND		HEAD LENGTH / SUPRATYMPANIC CREST	
Jacaltenango (20)	2.4–4.0 (3.0)	90% > 2.6	1.6–2.1 (1.9)	90% < 2.0	4.7–6.9 (5.5)	90% > 4.8
Tuxtla Gutierrez (25)	2.2–3.8 (2.9)	90% > 2.6	1.7–2.2 (1.9)	90% < 2.0	4.4–7.2 (5.5)	90% > 4.6
Totals (45)	2.2–4.0 (2.9)		1.6–2.2 (1.9)		4.4–7.2 (5.5)	
	90% > 2.6 (3.0) 80% > 2.6 (3.0)		90% < 2.0 (1.9) 80% < 2.0 (1.9)		90% > 4.7 (5.6) 80% > 5.1 (5.8)	
Tabasco (15)	1.8–2.5 (2.2)	90% < 2.4	1.8–2.3 (2.1)	90% > 2.0	4.0–5.5 (4.6)	90% < 4.8
El Peten (15)	1.4–2.0 (1.8)	90% < 2.0	2.0–2.8 (2.2)	90% > 2.0	3.0–4.6 (3.8)	90% < 4.1
Southern Veracruz (15)	1.7–2.6 (2.1)	90% < 2.3	1.9–2.5 (2.1)	90% > 1.9	4.0–4.9 (4.4)	90% < 4.6
Tamaulipas (13)	1.7–2.5 (2.1)	90% < 2.3	1.8–2.5 (2.2)	90% > 2.0	3.5–5.0 (4.5)	90% < 4.8
Southern Guatemala (9)	1.5–2.5 (2.0)	90% < 2.2	2.0–2.8 (2.4)	90% > 2.2	4.1–5.4 (4.7)	90% < 5.3
Nicaragua (5)	1.8–2.4 (2.1)	90% < 2.4	1.8–2.5 (2.2)	90% > 1.8	4.0–5.0 (4.4)	90% < 5.0
Totals (72)	1.4–2.6 (2.1)		1.8–2.8 (2.2)		3.0–5.5 (4.4)	
	90% < 2.4 (2.0) 80% < 2.3 (2.0)		90% > 2.0 (2.2) 80% > 2.0 (2.2)		90% < 4.8 (4.3) 80% < 4.7 (4.2)	

* In the above table are listed the extremes and means (in parentheses) of the several characters utilized in the diagnosis of *Bufo valliceps wilsoni* as observed in samples of males of various populations. The 80 and 90 per cent levels may vary several percentage points above or below the stated levels. Figures in parentheses following the localities indicate the number of individuals examined.

observed in *Bufo regularis* and *Bufo funereus* by Inger and Greenberg (Journ. Morph. 99(3): Figs. 6–9, 1956). The *valliceps* type is shown by Fig. 9 and the *coccifer* type by Fig. 6 and Fig. 8 (in part).

In singling out the Grijalva Valley population as distinct from other populations of *valliceps,* we do not mean to imply that all material from Tamaulipas to Nicaragua utilized in comparisons is conspecific. We mean, rather, that, with reference to the characters examined, the Grijalva Valley population differs from all others of the *valliceps* complex. We would even suggest that the Yucatan (and northern Guatemala) populations will probably have to be separated nomenclaturally from the populations of Veracruz and the Gulf Coastal Plain to the north. The same is indicated for more southern populations.

Acknowledgments: For the privilege of utilizing unreported materials in this study we wish to express our gratitude to our colleagues Norman E. Hartweg and William Duellman. Charles F. Walker has been most generous in aiding and advising us on a number of matters relating to *Bufo valliceps* in general. We are further indebted to Hobart M. Smith for making available to us a series of *Bufo valliceps macrocristatus.*

The authors wish to express their profound gratitude to D. E. S. Brown, without whose able leadership, generous help, sagacious advice and kindly encouragement, this work would have been impossible.

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A NEW SPECIES OF MOUSE (*PEROMYSCUS*) FROM NORTHWESTERN VERACRUZ, MEXICO

By E. Raymond Hall and Ticul Alvarez
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Lawrence, Kansas*

Several species of *Peromyscus* are included among mammals recently collected in the northern part of the Mexican state of Veracruz by M. Raymond Lee. One of these species proves to be without a name. The new species is related to *Peromyscus latirostris* Dalquest known from areas farther northwest and to *Peromyscus furvus* Merriam known from areas to the southward. These relationships, coupled with the intermediate geographic position of the area from which Dr. Lee obtained his specimens, caused us initially to suppose that his specimens were intergrades between the two named species. But, the specimens are not intermediate in several morphological features and consequently are not intergrades. Furthermore, the specimens in question differ from both of their relatives to so great a degree that we here accord specific, instead of subspecific, status to the unnamed mouse.

Peromyscus boylii (subspecies *levipes*) was taken in the same trap lines that yielded the new species. According to the field notes of the collector, the area where the mice were trapped supports long-needled pine. Individuals of the new species were caught most commonly around rocks and water seeps.

The new species may be named and described as follows:

Peromyscus angustirostris, new species

Type: Male, old adult, skin and skull, No. 83226 Museum of Natural History, University of Kansas; from 3 kilometers west of Zacualpan, 6,000 feet, Veracruz; obtained on 12 April 1960 by M. Raymond Lee, original number 1886.

Range: Known only from Zacualpan and 3 kilometers west thereof.

Diagnosis: Dorsum near (*n*) Mummy Brown (capitalized color terms after Ridgway, Color Standards and Color Nomenclature, Washington, D.C., 1912); sides approximately (16) Cinnamon; venter whitish; size large (see measurements); tail longer than head and body; nasals posteriorly acuminate, and anteriorly narrow; in M_1, internal terminus of first primary fold (terminology of teeth after Hooper, 1957, Misc. Publ., Mus. Zool., Univ. Michigan, 99: 9) deep and persisting as island when tooth greatly worn, mesostyle prominent, and cingulum only slightly developed.

Comparisons: From both *P. latirostris* and *P. furvus, P. angustirostris* differs in whitish underparts (near (*g*) Pale Smoke Gray in *latirostris,* and Pale Smoke Gray in *furvus*), lesser zygomatic breadth, narrower nasals, larger mesostyle on M_1, and smaller cingulum on each molar, especially on M_1. From *P. latirostris, P. angustirostris* further differs in: upper parts near (*n*) Mummy Brown instead of near (16 *l*) Prout's Brown; sides approximately (16) Cinnamon instead of near (16) Ochraceous Tawny; linear measurements less except length of tail that averages more, and in males ear that is approximately the same; nasals not expanded anteriorly as in many specimens of *latirostris*; posterior margin of palate rounded in most specimens instead of almost always truncate; in M_1, enamel island representing inner end of primary fold deeper. From *P. furvus,* additional differences in *P. angustirostris* are: upper parts less brownish; linear measurements approximately the same except that nasals average longer; tail averaging longer, instead of shorter, than head and body; nasals more acuminate posteriorly; longitudinal, dorsal outline of skull convex instead of almost straight from anterior part of cranium through interorbital region; tympanic bullae larger; in M_2, first secondary fold deeper and broader; in M_3, second primary fold prominent instead of almost absent; in m_1, second secondary fold absent, as also is opposite fold, with result that mesostylid and entoconid are almost united, and ectostylid and hypoconid are nearly united; in m_2, ectostylid better developed.

Measurements: Four old males (KU 83225–83228) and two old females (83231 and 83223), respectively: Total length, 267 (251–275), 275, 270; length of tail, 139 (132–145), 126, 140; length of hind foot, 29.5 (29–30), 28, 29; ear from notch, 21.2 (21–22), 21, 20; greatest length of skull, 34.9 (34.4–36.2), —, 35.0; zygomatic breadth, 16.5 (16.0–17.5), 16.7, 16.5; interorbital constriction, 5.0 (4.8–5.3), 5.2, 4.8; nasals (length), 14.4 (13.4–15.3), 14.3, 14.8; (length of) maxillary tooth-row, 5.0 (4.9–5.1), 5.2, 4.9.

Remarks: Comparison with the two known specimens of *Peromyscus nelsoni* from Jico, Veracruz, reveals that it differs greatly from the three species so far mentioned. *P. nelsoni* lacks the white tip on the tail that each of the three species has, is larger (maxillary tooth-row 6.6 and 6.7 instead of less than 5.4 mm), has the premaxillae extending posterior to nasals instead of vice versa, and mesostyle of M_1 larger anteroposteriorly.

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The resemblance is greater between *Peromyscus angustirostris* and *P. latirostris* than between *P. angustirostris* and *P. furvus,* especially in form of the teeth.

For comparison we have used the original series of 32 specimens of *P. latirostris* and 31 recently (1946) collected specimens of *P. furvus.* Of the 31, all from Veracruz, five are from 5 km north of Jalapa, and the other 26 are from 2 km west of Jico, Veracruz. Each of these two series, as well as the series of *P. angustirostris,* contains individuals ranging in age from young having only a slight amount of wear on the teeth to old individuals having most of the crowns of the teeth worn away. There are fewer (6) old individuals of *P. angustirostris* than there are of *P. latirostris* or of *P. furvus.*

In order to accommodate *P. angustirostris,* the key to nominal species of subgenus *Peromyscus* (pp. 609–612, in The Mammals of North America, by E. Raymond Hall and Keith R. Kelson, The Ronald Press, New York, March 31, 1959) needs modification on page 611 of the line reading "46′. Total length more than 240; tail more than 120 ---- *P. furvus,* p. 648." New lines can be substituted as follows:

46′. Total length more than 240; tail more than 120.
  a. Tail averaging shorter than head and body; longitudinal dorsal outline of skull almost straight from anterior part of cranium through interorbital region; second primary fold of M_3 almost absent ---------------------------- *P. furvus,* p. 648.
  a′. Tail averaging longer than head and body; longitudinal dorsal outline of skull convex; secondary primary fold of M_3 prominent -- *P. angustirostris.*

Specimens examined: Total, 31, all from Veracruz, as follows: 3 km west of Zacualpan, 6,300 feet, 24; Zacualpan, 6,000 feet, 7.

Acknowledgments: Study in the laboratory was supported by Grant No. 56 G 103 from the National Science Foundation. Field work was supported by grants from the Kansas University Endowment Association and the American Heart Association, Inc. We thank George H. Lowery, Jr., of Louisiana State University, for lending specimens of *Peromyscus latirostris.*

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A NEW PEARLFISH (FAMILY CARAPIDAE) FROM THE GULF OF CALIFORNIA[1]

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By Richard H. Rosenblatt

Scripps Institution of Oceanography, University of California, La Jolla, California

Recent investigations of the shelf fauna of the Gulf of California, México, have revealed a number of novelties, among which is an undescribed species of pearlfish. Reference to the review by Arnold (1957) leaves little doubt that this new form is referable to the genus *Echiodon* Thompson 1837. This is somewhat surprising since one of the two species placed with certainty in *Echiodon* occurs in the North Atlantic, and the other in the Mediterranean. However, the Pacific specimen shares certain distinctive characters with *Echiodon drummondi* Thompson 1837 and *E. dentatum* (Cuvier, 1817): There is a diastema in the lower jaw, the teeth are arranged in bands, the transverse processes of the third, fourth, and fifth vertebrae are unfused, and the anus is posterior (for a carapid). These features indicate that the present specimen cannot be placed either in *Carapus,* in which the tooth rows of the jaws are continuous, the lateral processes of the third and fourth vertebrae are fused, and the anus is under the pectoral base, or in *Encheliophis,* in which the teeth in the lower jaw are in a single continuous row, the lateral processes of the third, fourth, and fifth vertebrae are fused, and the anus is anterior in position.

Echiodon exsilium, new species

Fig. 1

Holotype: Fish Collection, Scripps Institution of Oceanography, University of California, La Jolla, S.I.O. 60-97-61A, a 100 mm ♀ taken by Robert H. Parker on the R. V. "Spencer F. Baird" in 35–41 fathoms on a muddy sand bottom off Estero de Tasiota (from 28° 13.8′ N, 111° 46.7′ W to 28° 15′ N, 111° 48′ W), Golfo de California, Sonora, México, on 21 March 1960. The type was taken in a shrimp trawl and the host is unknown. The specimen may have been free-living, since the collection contained no holothurians, no large lamellibranchs or echinoids, and only two gastropods of moderate size.

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[1] Contribution from the Scripps Institution of Oceanography, New Series.

Following are counts and measurements in millimeters of the type and single known specimen: Precaudal vertebrae 22; gill rakers $0 + 1 + 2$ (+ six rudiments); branchiostegals 7; pectorals 20; dorsal and anal undeterminable. Total length 100.0; snout to dorsal origin 20.9; snout to anal origin 17.1; snout to center of anus 17.0; body depth at anus 7.9; head length 14.1; head depth 6.0; head width 5.9; snout 3.1; bony orbit diameter 3.2; eye diameter 2.9; interorbit 2.0; upper jaw 7.2; pectoral 8+ (tips of middle rays curled).

The body is elongate and tapering; the maximum depth is at the anus and is contained 13 times in the total length. The head is about one-seventh of the total length. The upper profile of the head is slightly convex from the nape to before a point above the middle of the eye, then shallowly concave to a point even with the posterior nostril. Anterior to the posterior nostril the profile descends abruptly to the upper lip. The short, obtuse snout is 5 in the head. Both nostrils are circular, but the anterior ends in a short tube. The nasal capsule is large, half as long as the orbit. The olfactory rosette has five pairs of simple, flattened lamellae. The bony orbit goes 8 times in the snout and 4.8 times in the head. The narrow interorbital is contained 1.7 times in the orbit.

The maxillary extends behind the orbit for a distance somewhat less than one-half an orbit diameter. The lower jaw is slightly shorter than the upper, which overhangs it by a distance about equal to the diameter of the pupil. A fang at the front of each upper jaw is separated by a pronounced diastema from a band of villiform teeth, which is about five rows wide anteriorly and two rows wide posteriorly. The dentition of the lower jaw is similar, except that the diastema is more pronounced, and the bone narrows at this point (see Arnold, 1957: 256, Fig. 3B). The vomer is covered by an oval patch of blunt, almost granular, teeth. The villiform palatine teeth are in a band about four rows wide. The vomerine and palatine tooth patches are well separated. There are two crescentic patches of tiny upper pharyngeal teeth on each side. The toothless tongue ends in a narrow free forward projection.

The anus is posterior for a carapid: 2.8 mm behind a vertical through the middle of the pectoral base. The body cavity extends far back of the anus. It ends 18.4 mm behind the center of the anus, and is empty of any organs for the last 11.8 mm. In *Carapus* a similar cavity is filled by the gas-bladder. In *E. exsilium,* however, the gas-bladder is elongate and tightly applied to the roof of the body cavity. In this respect it resembles the gas-bladder of *E. dentatum* as figured by Emery (1880: Pl. II, Fig. 15).

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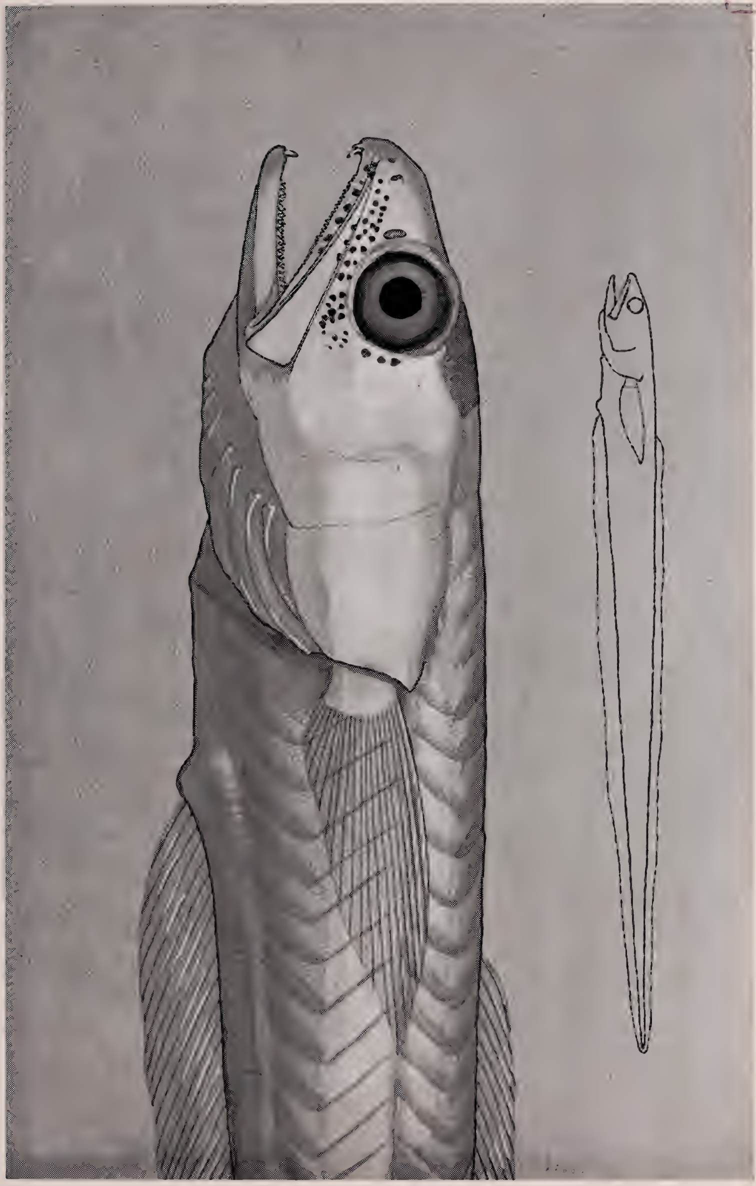

FIG. 1. *Echiodon exsilium* new species. Female holotype, SIO-60-97-61A. Total length, 100 mm.

There is a narrow slit behind the fourth gill arch. There appear to be no pseudobranchiae. The gill rakers are poorly developed. There are none on the upper limb of the first arch, and only the one at the angle and the two immediately below it are well developed. They are about half as long as the eye; the remaining six are developed as low rudiments only. The rakers of the posterior arches are all rudimentary.

I am unable to determine the position of the pores along the sensory canals of the head, nor can I observe any lateral line pores.

The origin of the dorsal is over the posterior third of the pectoral, and above a vertical from the tenth or eleventh anal ray. The dorsal and anal are confluent with the very reduced caudal. The pectoral is long and almost filamentous at the posterior extremity.

The body is mostly pale. The skull is dark brown around the brain case, and some dark pigment runs down either side of the snout and continues back beneath the eye as a feeble bar. The anterior half of the body is completely colorless, but about halfway back there begins a series of dots along the bases of the vertical fins. There is a dusting of black pigment over the posterior third of the body, concentrated mostly along the fin bases and the edges of the myomeres. The peritoneum is mostly white, although there are a few melanophores ventrally, and a larger number dorsally.

The name is derived from the Latin *exsilium,* an exile, and refers to the geographic isolation of the species from other members of the genus.

Echiodon exsilium is not closely related to the carapids reported in the eastern Pacific, *Carapus dubius* (Putnam 1874), *Encheliophis jordani* Heller and Snodgrass, 1903, and *E. hancocki* (Reid, 1940). The characters which separate the genus *Echiodon* from the species of the above genera are discussed in the introduction.

Arnold placed two species in *Echiodon, E. drummondi* Thompson, 1837, and *E. dentatum* (Cuvier, 1817). On the basis of dentition, *E. exsilium* is closer to *dentatum* than to *drummondi.* As in *dentatum* the vomerine tooth patch is rounded posteriorly, and there is a distinct gap between the vomerine and palatine dentition. *E. exsilium* also agrees with *dentatum* in the relatively anterior insertion of the dorsal fin (see Arnold's Figs. 16 and 17). *E. dentatum* and *exsilium* differ markedly in head shape, however. In *E. dentatum* the major outline of the head is concave from the occiput to the snout, whereas in *E. exsilium* the major outline of the upper surface of the head is convex (there is a shallow concavity, just before the eyes). Also, the head is wider (width 42% of head length rather than 32%) and the pectoral fin longer (56% of head length rather than 42%) in *exsilium* than in *dentatum.* In addition there appears to be a difference in the number of precaudal vertebrae. According to Emery (1880: 26), *E. dentatum* has 95 vertebrae of which 26 are precaudal. Radiographs of the type of *E. exsilium,* however, indicate that only the first 22 vertebrae bear unfused haemal arches. In the 23rd vertebra the haemal arches are fused to form a haemal spine. This is not an apparent effect produced by the hiding of one haemal element by another in the picture, since three radiographs, each taken from a different angle, show only 22 precaudal vertebrae. Due to the attenuation of the body, the total number of vertebrae cannot be determined.

Arnold felt that two more species might prove to be referable to *Echiodon.* These are *Carapus rendahli* Whitley, 1940, and *C. cinereus* Smith, 1955. The sketchy description of *C. rendahli* indicates that in that species the pectoral fin is considerably shorter (4 in the head rather than 1.8) and the dorsal origin farther forward (predorsal about .9 in head rather than .66). *Carapus cinereus* differs from *E. exsilium* in a number of respects. The most important difference involves the vomerine dentition. In *C. cinereus* (as in a number of species of *Carapus*) the vomer bears a median row of enlarged teeth, while in *E. exsilium* none of the vomerine teeth is enlarged. Also in *C. cinereus* the dorsal and anal origins are farther forward (predorsal 15% of total length rather than 21%) and the head is somewhat shorter (10.8% of length rather than 14.1%). It is not likely that the observed difference in head length is due to the greater size of the type of *C. cinereus* (215 mm), since the observed tendency in the Carapidae is for the head to become proportionally larger with increasing size (Arnold, 1957).

The zoogeographic implications of the discovery of a species of *Echiodon* in the eastern tropical Pacific are difficult to assess. It is unfortunate that the generic affinities of the Indian Ocean and Pacific species *Carapus cinereus* and *C. rendahli* cannot be determined with certainty, although it seems probable that *rendahli* at least will prove to be referable to *Echiodon.* The available evidence suggests that the affinities of *E. exsilium* lie with the Atlantic species, especially *E. dentatum.* This would suggest that *E. exsilium* or a progenitor entered the eastern Pacific from the east, via a Tertiary Central American water gap (Durham and Allison, 1960: 66–68, Fig. 7), rather than from the west, across the eastern Pacific barrier (Ekman, 1953: 72–75). If this hypothesis is correct, it might reasonably be expected that the western Atlantic might harbor a species of *Echiodon.* That no such form has yet been captured is not surprising considering the rarity of carapids in collections.

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REMARKS ON THE SYSTEMATICS OF THE SARKODINA (PROTOZOA), RENAMED HOMONYMS AND NEW AND VALIDATED GENERA

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In a recent publication (Loeblich and Tappan, 1961) the writers presented an outline of the suprageneric classification of the Rhizopodea, which is to be used in the "Treatise on Invertebrate Paleontology." Since completion of that manuscript certain new developments in protozoan systematics have necessitated slight modifications, and these are here presented. In addition, several proposed genera of the "Testacea" and Foraminifera to be included in the "Treatise" have been found to be homonyms or nomina nuda and are here renamed, and five new foraminiferal genera are described so that they may be included in the "Treatise."

In the outline of suprageneric classification above mentioned, the writers recognized three subclasses within the class Rhizopodea. These subclasses, Lobosia, Filosia and Granuloreticulosia are based on the type of pseudopodia. In addition, mention was made of the recent work by Jahn and Rinaldi (1959: 15) on the mechanism of protoplasmic movement, which gave an added means of separation of the subclass Lobosia from the other two subclasses of the Rhizopodea. More recent work by Jahn, Bovee and Small (1960) has shown the advisability of recognizing a major dichotomy of the subphylum Sarkodina on the basis of protoplasmic movement.

Part of the Sarkodina are characterized by a protoplasmic movement based on differential pressure due to contraction of a plasmagel cortex, which results in a flow of plasmasol.

This mechanism has generally been accepted for the Amoebida and Mycetozoida, but is not characteristic of the remaining divisions of the Sarkodina. The remainder of the Sarkodina are characterized by a filiment-streaming type of protoplasmic movement, regarded by Jahn and Rinaldi (1959) as due to a shearing force between two adjacent oppositely moving gel-like filaments within a pseudopod, and without the presence of a plasmagel cortex.

Inasmuch as the protozoan subphyla are separated on the mechanism of movement (by pseudopodia, flagella or cilia), it is logical to assume that the two distinct mechanisms are of taxonomic importance within the Sarkodina. The separation on this basis does not entirely agree with earlier classifications, as the Lobosia are thus separated as one division opposed to the filament-streaming mechanism in both the Filosia and Granuloreticulosia of the old Rhizopodea, and the Radiolaria, Heliozoia and Acantharia of the old class Actinopodea.

A reorganization of the Sarkodina, on the basis of protoplasmic movement has been under discussion by members (including Alfred R. Loeblich, Jr.) of the Committee on Taxonomy and Taxonomic Problems of the Society of Protozoologists. Although final decisions have not yet been reached by this committee, the writers are recognizing this dichotomy in the "Treatise on Invertebrate Paleontology," hence are herein restricting the class Rhizopodea to include only the subclass Lobosia characterized by the pressure flow mechanism and are recognizing the class Reticularia Lankester as distinct, including those subclasses characterized by the filament-streaming mechanism, the Filosia, Granuloreticulosia, Radiolaria, Heliozoia, and Acantharia. These last three subclasses have already been covered for the "Treatise on Invertebrate Paleontology" by Campbell and Moore, 1954.

In the reclassification of the order Foraminiferida by the writers (Loeblich and Tappan, 1961), 17 superfamilies were recognized, based on wall composition, structure and chamber development. As certain of these superfamilies are more closely related than others, it is thought advisable to group these somewhat more concisely into suborders, based solely on wall composition. These are similar in part to the divisions

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used approximately a century ago by Carpenter, Parker and Jones, 1862, Lankester, 1885, etc.—i.e., Imperforata and Perforata, Arenacidae, etc. The names used herein for the suborders are based on the names of included genera. Although categories of ordinal rank are not required to be recognized on the basis of priority, we have done so when subordinal names based on an included genus were available. These suborders thus are the Allogromiina Loeblich and Tappan, new suborder, Textulariina Delage and Hérouard, 1896, Fusulinina Wedekind, 1937, Miliolina Delage and Hérouard, 1896, and Rotaliina Delage and Hérouard, 1896.

Subphylum SARKODINA Hertwig and Lesser, 1874

Class Rhizopodea von Siebold, 1845

Unicellular organisms with amoeboid principal stage, no meganucleus; pseudopodia lobose, very rarely filiform or anastomosing, naked forms with protoplasm differentiated into endoplasm and ectoplasm, and shelled forms with zonal differentiation of protoplasm frequent. In some forms plasmodia may develop by fusion of individual amoebulae. Protoplasmic movement occurs by means of a flow of plasmasol caused by differential pressure due to contraction of plasmagel cortex (see Jahn and Rinaldi, 1959: 101).

The Rhizopodea is here restricted to include only the subclass Lobosia, with orders Amoebida, Arcellinida, and Mycetozoida.

Subclass Lobosia Carpenter, 1861

Order Arcellinida Kent, 1880

Superfamily Arcellacea Ehrenberg, 1832

Family Hyalospheniidae Schulze, 1877

Apodera Loeblich and Tappan, new genus

Type species: Nebela vas Certes (1891: L15).

Test 130–210 μ in length, with subspherical body, separated from the narrowed neck by a distinct constriction, represented in the interior by a chitinous girdle; wall composed of large, regular, oval plates. Recent: southern hemisphere, South America, Australia, Hawaii, Java, Africa.

Remarks: The genus was proposed by Jung (1942a: 256; 1942b: 369, 380) with the description of two species and one variety, but without type citation and therefore a nomen nudum needing validation.

Certesella Loeblich and Tappan, new genus

Type species: Nebela martiali Certes (1891: L14).

Test chitinous, 80–200 μ in length, flask-shaped with large, very thin, almost transparent, polygonal plates; with 6 large pores in addition to the aperture, arranged in pairs, the first pair about midway on the neck, the other two pairs perpendicular to these at the base of the neck, additional small pores occur near the aperture. Recent: southern hemisphere.

Remarks: Proposed by Jung (1942a: 256, 317; 1942b: 381) as *Penardiella* (*Nebela*) (a homonym of *Penardiella* Kahl, 1930) without type designation and therefore a nomen nudum needing validation. It is interesting to note that *Nebela* Leidy, 1875 was placed as a subgenus of *Penardiella* Jung, 1942.

Jungia Loeblich and Tappan, new genus

Type species: Jungia sundanensis van Oye (1949: 331).

Test sack-like, globular to ovate, not compressed, of polygonal or elongate plates with a rim of sand grains forming a collar around the aperture; aperture round, central. Recent: Java, Venezuela.

Remarks: Proposed by van Oye (1949: 330) with description of two species, but without type citation and therefore a nomen nudum needing validation.

Superfamily CRYPTODIFFLUGIACEA Jung, 1942

Family Cryptodifflugiidae Jung, 1942

Petalopella Loeblich and Tappan, new name

Type species: Petalopus diffluens Claparède and Lachmann (1859: 442).

Petalopella, new name, is proposed for *Petalopus* Claparède and Lachmann (1859: 442), not *Petalopus* Kirby and Spence, 1828, and not *Petalopus* Motschoulsky, 1845.

Class RETICULAREA Lankester, 1885, name corrected

Class Reticularia Lankester, 1885, Encyclopaedia Britannica, 9th Ed., v. 19: 845

Unicellular organisms with amoeboid principal stage; pseudopodia may be filopodia, reticulopodia, or axopodia; may have secreted or agglutinated skeleton; protoplasmic movement by an active shearing or sliding between adjacent gel-like filaments moving in opposite directions in the same pseudopod, and in the absence of a plasmagel cortex.

The class Reticularea includes subclass Filosia with orders Aconchulinida and Gromiida, subclass Granuloreticulosia with orders Athalamida, Foraminiferida (including the order Monothalamida of the earlier publication of the writers, 1961), Xenophyophorida and Labyrinthulida and the subclasses Radiolaria, Heliozoia, and Acantharia.

Subclass FILOSIA Leidy, 1879

Order GROMIDA Claparède and Lachmann, 1859

Superfamily GROMIACEA Reuss, 1862

Family Gromiidae Reuss, 1862

Bargoniella Loeblich and Tappan, new name

Type species: Salpicola amylaceae Bargoni (1894: 43).

Bargoniella, new name, is proposed for *Salpicola* Bargoni (1894: 43), not *Salpicola* Richiardi, 1880.

Family Amphitremidae Poche, 1913

Archerella Loeblich and Tappan, new name

Type species: Ditrema flavum Archer (1877a: 103; 1877b: 336).

Archerella, new name is proposed for *Ditrema* Archer (1877a: 103; 1877b: 336), not *Ditrema* Temminck and Schlegel, 1844.

Subclass GRANULORETICULOSIA de Saedeleer, 1934

Order FORAMINIFERIDA Zborzewski, 1834

Suborder **ALLOGROMIINA** Loeblich and Tappan, new suborder

Test membranous or chitinous, may have ferruginous encrustations or more rarely small quantities of agglutinated material. Includes the superfamily Lagynacea Schultze, 1854.

Suborder TEXTULARIINA Delage and Hérouard, 1896, name corrected

Suborder TEXTULARIDAE Delage and Hérouard, 1896, Traité Zool. Concrète: 139

Test agglutinated with foreign matter held by various cements. Includes superfamilies Ammodiscacea Reuss, 1862, and Lituolacea Lamarck, 1809.

Superfamily AMMODISCACEA Reuss, 1862

Family Saccamminidae Brady, 1884

Subfamily **Diffusulininae** Loeblich and Tappan, new subfamily

Test free or attached, with interior partially subdivided into chamberlets. Type genus: *Diffusulina* Heron-Allen and Earland, 1924.

Oryctoderma Loeblich and Tappan, new genus

Type species: Crithionina rotundata Cushman, 1910: 56.

Test free, large, globular, unilocular; central cavity relatively small, simple and spherical; wall agglutinated, very thick and loosely cemented, with numerous ramifying canals leading from the central cavity to the exterior, the margins of the canals being relatively firmly cemented; apertures consist of numerous circular to polygonal openings on the surface which lead into these canals.

Remarks: The type species of this genus was originally placed in *Crithionina* Goës. However, the redescription of the type species (*C. mamilla* Goës) by Höglund (1947: 31) based on the original material of Goës, has shown that this genus should be restricted to the attached forms with relatively thin and simple wall, and large chamber cavity divided by a single more or less well-developed partial septum. The free-living species with small central cavity and thick wall traversed by labyrinthine canals opening into large surface perforations therefore are removed from *Crithionina* to the new genus *Oryctoderma.* In addition to *C. rotundata,* the Recent *C. pisum* Goës, 1896, and probably *C. rugosa* Goës, 1896, and *C. teicherti* Parr, 1942 (Permian of Australia), belong to the new genus.

Daitrona Loeblich and Tappan, new genus

Type species: Crithionina lens Goës, 1896: 24.

Test free, 2–4 mm in diameter, lenticular in section, rounded to oblong in plan; the single chamber subdivided by radial semisepta or secondary partitions, projecting inward from the wall, sometimes almost completely subdividing the test; wall finely agglutinated, loosely cemented; no localized aperture.

Remarks: *Daitrona,* new genus, differs from *Crithionina* Goës in being free and in having numerous radiating secondary partitions subdividing the chamber. It differs from *Oryctoderma,* new genus, in having a thin wall with secondary partitions nearly completely segmenting the test, rather than a thick wall with labyrinthine passages connecting the smoothly finished inner cavity to the exterior.

Superfamily LITUOLACEA Lamarck, 1809

Family Ataxophragmiidae Schwager, 1877

Subfamily Eggerellinae Cushman, 1937

Multifidella Loeblich and Tappan, new genus

Type species: Clavulina communis d'Orbigny var. *nodulosa* Cushman (1922a: 85).

Test free, elongate, early portional trochospiral with four or five chambers per whorl, progressively reducing to triserial, biserial, and uniserial, the uniserial stage comprising a large proportion of the adult test; wall finely agglutinated, aperture terminal, cribrate, consisting of variously aligned, elongate slits with bordering lips. Range: Miocene–Recent.

Remarks: Multifidella, new genus, differs from *Cribrogoesella* Cushman in the slender test with elongate uniserial stage and in having a multiple aperture consisting of slits with bordering lips. Originally described as *Clavulina,* the present type species was later transferred to *Listerella* Cushman, 1933 (not *Listerella* Jahn, 1906 = *Schenckiella* Thalmann, 1942) by Cushman (1936: 428), to *Schenckiella* by Cushman and Todd (1945: 8) and to *Martinottiella* by Cushman (1947: 50). *Schenckiella* is regarded by the writers as a synonym of *Martinottiella* Cushman, 1933. The present genus appears to have arisen from *Martinottiella* by the development of a multiple aperture much as *Cribrogoesella* Cushman, 1935, developed from *Goesella* Cushman, 1933. The lectotype of *Multifidella nodulosa* Cushman, here designated (USNM

16312b), is from *Albatross* Station D2547, lat. 39° 54′ 30″ N, long. 70° 20′ 00″ W, at 390 fathoms.

Suborder FUSULININA Wedekind, 1937, name corrected

Suborder Fusulinacea Wedekind, 1937, Einführung in die grundlagen der historischen geol., Band 2: 79

Primitively of microgranular calcite, advanced forms with two or more differentiated layers in the wall. Includes the superfamilies Parathuramminacea Bykova, 1955; Endothyracea Brady, 1884; and Fusulinacea Möller, 1878.

Suborder MILIOLINA Delage and Hérouard, 1896, name corrected

Suborder Miliolidae Delage and Hérouard, 1896, Traité Zool. Concrète: 117

Wall porcellanous, imperforate at least in postembryonic stages. Includes superfamily Miliolacea Ehrenberg, 1839.

Suborder ROTALIINA Delage and Hérouard, 1896, name corrected

Suborder Rotalidae Delage and Hérouard, 1896, Traité Zool. Concrète: 143

Wall calcareous, perforate. Includes superfamilies Nodosariacea Ehrenberg, 1839; Buliminacea Jones, 1875; Asterigerinacea d'Orbigny, 1839; Rotaliacea Ehrenberg, 1839; Globigerinacea Carpenter, Parker and Jones, 1862; Orbitoidacea Schwager, 1876; Cassidulinacea d'Orbigny, 1839; Carterinacea Loeblich and Tappan, 1955; and Spirillinacea Reuss, 1862.

Superfamily NODOSARIACEA Ehrenberg, 1839

Family Nodosariidae Ehrenberg, 1839

Subfamily Nodosariinae Ehrenberg, 1839

Lankesterina Loeblich and Tappan, new genus

Type species: Bolivina frondea Cushman (1922b: 126).

Test free, small, symmetrically biserial throughout, with flattened sides and truncate margins; chambers low and broad as in the later stage of *Dyofrondicularia,* but without an early uniserial stage; wall calcareous, finely perforate; aperture terminal, radial. Range: Oligocene.

Remarks: Originally described as a *Bolivina,* the type species of the present genus was later transferred to *Polymorphina* by Cushman (1929: 41) because of the radial aperture, which was illustrated by Cushman and Ozawa (1930: Pl. 30, Fig. 11). *Lankesterina* differs from *Polymorphina* in being completely symmetrical throughout and in having truncate margins, similar to the other palmate genera of the Nodosariinae (*Dyofrondicularia, Frondicularia,* etc.), but differs from these in being biserial throughout. *Polymorphina* is somewhat asymmetrical particularly in its early development, and may show traces of a sigmoid development.

The genus is named in honor of Sir Edwin Ray Lankester (1847–1929) in recognition of his outstanding contributions to the systematics of the Protozoa, and the foraminifera in particular.

Astacolus Montfort, 1808

Astacolus barrowensis Tappan, new name

Astacolus calliopsis Tappan, 1955, U. S. Geol. Survey Prof. Paper 236-B: 55, Pl. 17, Figs. 12–17 (not *Astacolus calliopsis* (Reuss), 1863, Bartenstein and Brand, 1951).

This species was noted by Thalmann (1958: 761) to be a homonym and it is herewith renamed. It occurs in the lower Jurassic Kingak formation (of Late Pliensbachian age) in South Barrow Test Well 3, south of Point Barrow, northern Alaska. The new specific name refers to the locality from which it was obtained.

Family Glandulinidae Reuss, 1860

Subfamily Glandulininae Reuss, 1860

Entolingulina Loeblich and Tappan, new genus

Type species: Lingulina aselliformis Buchner, 1942: 121.

Test free, elongate, compressed, of two or more chambers in a rectilinear series, commonly with considerable overlap of earlier chambers; wall calcareous, finely perforate, hyaline; aperture ovate or an elongate slit, with a distinct entosolenian tube projecting into the final chamber.

Remarks: Entolingulina, new genus, differs from *Lingulina* in having an entosolenian tube and from *Glandulina* in lacking the early biserial stage, in being compressed, and in the slit or ovate aperture rather than a radiate one. Many two-chambered species have been described which may belong to *Entolingulina,* but may also be twinned or freak specimens of *Fissurina.* This can be determined only by an examination of suites of these species and associated *Fissurina* if any. Among these two-chambered forms possibly referable to *Entolingulina* are *Lingulina armata* Sidebottom, 1907, *L. bicarinata* forma *nasuta* Buchner, 1942, *L. carinata* var. *biloculi* Wright, 1911, *L. cornigera* Buchner, 1942, *L. cucullifera* Buchner, 1942, *L. falcata* Heron-Allen and Earland, 1932, *L. herdmanni* Chaster, 1892, *L. inarimensis* Buchner, 1942, *L. lagenoides* Buchner, 1942, *L. translucida* Heron-Allen and Earland, 1932, and *L. tubulata* Buchner, 1942.

Superfamily ROTALIACEA Ehrenberg, 1839

Family Pellatispiridae Hanzawa, 1937

Pokornyella Loeblich and Tappan, new name

Type species: Siderina douvillei Abrard (1926: 31).

Pokornyella, new name, is proposed for *Siderina* Abrard (1926: 31), not *Siderina* Dana, 1848. It is named in honor of Dr. V. Pokorný, Charles University, Prague, Czechoslovakia, in recognition of his contributions to micropaleontology.

Subclass RADIOLARIA J. Müller, 1858

Although four recent monographs have been concerned with this group (Campbell in Moore, 1954; Deflandre in Grassé, 1953; Deflandre in Piveteau, 1952, and Streklov and Lipman in Rauser-Chernousova and Fursenko, 1959) a number of generic homonyms have not yet been renamed. For other homonyms, new names have been proposed in the past, but overlooked or regarded as synonyms of the invalid homonyms. These are here discussed, and the homonyms renamed under the family headings as used by Campbell in Moore, 1954. Some family group names are also changed from those used by Campbell, on the basis of priority. Only family group names applying to the corrected genera are here included.

The publication of Haeckel, 1882, cited by Campbell in Moore (1954) was according to the cover for this number actually published and distributed 25 November 1881, hence dates for the families cited below as Haeckel, 1881, refer to the publication listed by Campbell as 1882.

Superfamily THALLASSOSPHAERACEA Haeckel, 1862, name corrected

Family Thalassosphaeridae Haeckel, 1862

Thalassorhaphis Campbell, 1951

Campbell proposed the genus (1951: 527) as *Thalassorhaphis,* with type species *Thalassoplancta brevispicula* Haeckel, 1887. In a later paper Campbell (1953: 298) corrected this to *Thalassorrhaphis,* stating that it was originally incorrectly derived, and was corrected to agree with rules of Greek word composition. According to the rules, changes are not allowed on the basis of incorrect word formation, only when these can be shown to be a lapsus calami or typographical error.

Family Lithacanthidae Popofsky, 1907

Genus **Tetracina** Loeblich and Tappan, new name

Type species: Tetracanthus simplex Popofsky, 1907.

The name is proposed for *Tetracanthus* Popofsky, 1907, Zool. Anzeiger, vol. 31: 701; not *Tetracanthus* Hemprich and Ehrenberg, 1866, in Schneider, Monogr. Nemat.: 104. Verm. (Nemat.) See Campbell (1954: D46).

Superfamily ETHMOSPHAERACEA Haeckel, 1862, name transferred

Family Ethmosphaeridae Haeckel, 1862, name transferred

[Ethmosphaerida Haeckel, 1862; Ethmosphaerinae Campbell, 1954; Liosphaerida Haeckel, 1881; Liosphaeridae Campbell, 1954; Cenosphaeridae Deflandre, 1952.]

According to the rules, no family can include a subfamily of prior date, hence this family name must be Ethmosphaeridae Haeckel, 1862; not Liosphaeridae Haeckel, 1881.

Subfamily Ethmosphaerinae Haeckel, 1862

Cenosphaera Ehrenberg, 1854

Subgenus **Chaunosphaera** Loeblich and Tappan, new name

Type species: Cenosphaera primordialis Haeckel, 1887.

Cenosphaera (*Chaunosphaera*) is here proposed for *Cenosphaera* (*Porosphaera*), as *Porosphaera* Haeckel, 1887, Rep. Voy. *Challenger* Exped. Zool., vol. 18(1): 67, is preoccupied by *Porosphaera* Steinmann, 1878, Palaeontogr., vol. 25, no. 3: 120, Spong. *Porosphaera* is recognized by Campbell (1954: D50) and Deflandre in Piveteau (1952: 770).

Subfamily Plegmosphaerinae Haeckel, 1881

Dictyoplegma Haeckel, 1862

Type species: Dictyosoma spongiosum Müller, 1858.

Dictyoplegma Haeckel, 1862, Radiolaria, vol. 1: 452, 458, was proposed as a new name for *Dictyosoma* Müller, 1856, Monatsber. Akad. Wiss. Berlin, 1856: 485; not *Dictyosoma* Temminck and Schlegel, 1845, in Siebold, F. Japon. (Pisc.): 139, Pisces. The name *Dictyosphagma* Mivart, 1878, was also proposed as a new name for this genus, and is an objective synonym. Campbell (1954: D50) cites *Spongodictyon* Haeckel, 1862 (= *Spongodictyum*?) as an objective synonym of *Dictyosoma* and *Spongodictyon* also was used by Deflandre in Grassé (1953: 342) and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 433).

This genus and its type subgenus thus should be referred to *Dictyoplegma* Haeckel, 1862, and the subgenus *Dictyosoma* (*Spongodictyoma*) Haeckel, 1862, should be transferred to *Dictyoplegma* (*Spongodictyoma*).

Family Triposphaeridae Vinassa de Regny, 1898

Vinassaia Cossmann, 1900

Vinassaia was proposed by Cossmann, 1900, Rev. Crit. Palaezool. vol. 4: 42, for *Rustia* Vinassa de Regny, 1898, Riv. Ital. Paleont., vol. 4: 53; not *Rustia* Stål, 1866, Hem. Afric., vol. 4: 8, Hem. Both Deflandre in Grassé (1953: 417) and Campbell in Moore (1954: D56) cite the genus under the homonymous name, without mention of *Vinassaia*, proposed as its replacement.

Family Actinommidae Haeckel, 1862, name corrected and transferred

[Actinommida Haeckel, 1862; Actinommatinae Campbell, 1954]

This family was regarded as Astrosphaeridae Haeckel, 1882, by Campbell in Moore (1954: D60), but as a family cannot contain a subfamily of prior date, the earliest family group name is here used.

Subfamily Astrosphaerinae Haeckel, 1881

Anomalacantha Loeblich and Tappan, new name

Type species: Heteracantha dentata Mast, 1910.

The new name is here proposed for *Heteracantha* Mast, 1910, Ergeb. Tiefsee-Exped., vol. 19, no. 4: 159–161; not *Heteracantha* Brullé, 1834, H. N. Ins., vol. 4, no. 2 (Col.): 383. Col. See Campbell in Moore (1954: D62).

Anomalosoma Loeblich and Tappan, new name

Type species: Heterosoma heptacanthum Mast, 1910.

Anomalosoma is proposed as a new name for *Heterosoma* Mast, 1910, Ergeb. Tiefsee-Exped., vol. 19, no. 4: 167; not *Heterosoma* Schaum, 1845, Ann. Soc. ent. France, ser. 2, vol. 2: 390, 426. Col. (Cetoniid.); and not *Heterosoma* Bernhauer, 1903, Ent. Ztg. Stettin, vol. 64: 33. Col. (Staphylinid). See Deflandre in Grassé (1953: 403–404) and Campbell in Moore (1954: D62).

Superfamily SPONGURACEA Haeckel, 1862, name transferred

[Spongurida Haeckel, 1862; Ellipsida Haeckel, 1887; Prunoidea Haeckel, 1887; Ellipsidiicae Campbell, 1954]

The superfamily was referred to the Ellipsidiicae by Campbell in Moore (1954: 68) but as a superfamily cannot contain a family or subfamily of prior date, the earliest family group name is here used and elevated to superfamily rank.

Family **Cyphantellidae** Loeblich and Tappan, substitute name

The type genus of the family Cyphantidae Campbell, 1954, is a homonym. As *Cyphantella* Haeckel, 1887, replaces *Cyphanta* Haeckel, 1887, as the valid name for this taxon, the new family name Cyphantellidae is proposed, with *Cyphantella* Haeckel, 1887, as type genus.

Cyphantella Haeckel, 1887

Type species: Cyphanta colpodes Haeckel, 1887.

Both Deflandre in Grassé (1953: 421) and Campbell in Moore (1954: D74) refer to this genus as *Cyphanta* Haeckel, 1887 (Rep. Voy. *Challenger*, Zool., vol. 18, pt. 1: 360), which is a homonym of *Cyphanta* Walker, 1865, List Specimens Lep. Ins. Brit. Mus., vol. 33: 855, Lep. Although *Cyphantella* Haeckel, 1887, was regarded as an objective synonym of *Cyphanta* by Campbell, it is the first valid name available for the genus.

The type subgenus will therefore be referred to *Cyphantella* (*Cyphantella*), and *Cyphanta* (*Cyphantissa*) Haeckel, 1887, becomes *Cyphantella* (*Cyphantissa*).

Superfamily COCCODISCACEA Haeckel, 1862, name transferred

[Coccodiscida Haeckel, 1862; Cenodiscida Haeckel, 1887; Cenodiscicae Campbell, 1954]

Subsuperfamily Coccodiscilae Haeckel, 1862, name transferred

The oldest validly proposed family group names within this superfamily are Coccodiscida Haeckel, 1862, and Trematodiscida Haeckel, 1862. The last named is based on the genus *Trematodiscus* Haeckel, 1860, an objective synonym of *Flustrella* Ehrenberg, 1839. Therefore, the superfamily name must be based on the family Coccodiscidae Haeckel, and it is here transferred to superfamily status.

The subsuperfamily Cenodiscilae Haeckel, 1887, of Campbell in Moore (1954: D76) thus becomes the Coccodiscilae Haeckel, 1862. The family names remain unchanged within the Coccodiscilae.

Family Phacodiscidae Haeckel, 1881

Subfamily Heliosestrinae Haeckel, 1887

Triactoma Rüst, 1885

Triactis Haeckel, 1881, Jena. Zeitsch., vol. 15: 457. *Type species: Triactoma tithonianum* Rüst, 1885, subsequent designation by Campbell in Moore, 1954: D81; not *Triactis* Klunzinger, 1877, Koralthiere rothen Meeres, vol. 1: 85.

Triactoma Rüst, 1885, Palaeontographica, vol. 31 (N.F., vol. 11): 289. *Type species: Triactoma tithonianum* Rüst, 1885, subsequent designation by Campbell in Moore, 1954: D81.

Triactiscus Haeckel, 1887, Rep. Voy. *Challenger* Exped., Zool., vol. 18, pt. 1: 421. *Type species: Triactiscus tripyramis* Haeckel, 1887, subsequent designation by Strelkov and Lipman in Rauser-Chernousova and Fursenko, 1959: 443.

The nomenclatural status of this genus has been confused. Campbell in Moore (1954: D81) recognized this genus as *Triactis* Haeckel, 1882 (sic), and cited *Triactoma titonianum* (sic) Rüst (correctly *Triactoma tithonianum*). Both *Triactoma* and *Triactiscus* were listed as objective synonyms, indicating that all three have the same type species. None of these three generic names was mentioned by Deflandre in Grassé (1953), but Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 443) recognize *Triactiscus* with *T. tripyramis* Haeckel listed as type species. The generic name *Triactis* was proposed by Haeckel (1881: 457), without citation of species, hence any species could be later selected as type. However, the name was a homonym of *Triactis* Klunzinger, 1877.

Triactoma was used by Rüst, apparently as a substitute name for *Triactis* Haeckel, 1881, not Klunzinger, 1877, although the earlier name was not mentioned. Rüst stated (1885: 10) that he followed the classification, families and genera of Haeckel (1881) and that the latter was so detailed that only two new generic names were required for the

Jurassic forms, *Podocapsa* and *Salpingocapsa.* In the description of these two new genera by Rüst the new names were followed by the notation "n.g." and a generic diagnosis. *Triactoma* was merely given as a heading (as were the other generic names of Haeckel) before the descriptions of the species included therein. Furthermore, *Triactoma* is not mentioned by Neave, 1940, in Nomenclator Zoologicus, or in the supplement (1950). Rüst included and described three species in *Triactoma*—all new, *Triactoma tithonianum, T. pachyacantha* and *T. ilsedense.* The type species selected by Campbell in Moore was the first species described in Rüst's publication.

In 1887 Haeckel used the generic name *Triactiscus,* as a substitute name for *Triactis.* Although he did not mention the change in spelling, he cited the earlier paper and page where *Triactis* was described. No mention was made of Rüst's paper, and it is possible that the *Challenger* report was already in press before Rüst's paper had appeared. Haeckel described three species under *Triactiscus, T. tripyramis,* n. sp., *T. tricuspis,* n. sp., and *T. tripodiscus* Haeckel (including *Haliomma triactis* Ehrenberg, 1875, as a synonym, which has priority as a specific name over *T. tripodiscus*). As only three species were included by Haeckel, one of these must be cited as type. It cannot be an objective synonym of *Triactoma,* as stated by Campbell, as *Triactoma tithonianum* Rüst was not in the original list of species included in *Triactiscus.* The citation of *Triactiscus tripyramis* Haeckel as type, by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 443) is therefore valid—this being the first of the three species cited by Haeckel. Although both *Triactoma* and *Triactiscus* were apparently intended as new names for the homonym *Triactis* Haeckel, 1881, not Klunzinger, 1877, they nevertheless have different type species, as these were fixed by subsequent designation and must therefore in each case be one of the species included by the author of the genus.

The correct name for this genus is therefore *Triactoma* Rüst, 1885, as it has priority over *Triactiscus* Haeckel, 1887.

Subsuperfamily Ommatodiscilae Stöhr, 1880, name transferred

[Trematodiscida Haeckel, 1862; Ommatodiscidae Stöhr, 1880; Cyclodiscarea Haeckel, 1887; Euchitoniilae Campbell, 1954]

The oldest validly proposed family group name within this subsuperfamily is Trematodiscida Haeckel, 1862, based on *Trematodiscus* Haeckel, 1860, which is an objective synonym of *Flustrella* Ehrenberg, 1839. The oldest name based on a valid generic name is therefore the Ommatodiscida Stöhr, 1880, which should be used as a basis for the family group names referred by Campbell in Moore (1954) to the family Euchitoniidae Haeckel, 1887 [= Ommatodiscidae] and the subsuperfamily Euchitoniilae [= Ommatodiscilae].

Family Ommatodiscidae Stöhr, 1880

Subfamily Euchitoniinae Haeckel, 1887

Amphibrachella Haeckel, 1887

Type species: Amphibrachium diminutum Haeckel, 1887.

The name *Amphibrachella* Haeckel, 1887, was regarded as an objective synonym of *Amphibrachium* Haeckel, 1881, by Campbell in Moore (1954: D86). *Amphibrachium* was also recognized by Deflandre in Grassé (1953: 349), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 446). However, *Amphibrachium* Haeckel, 1881, Jena Zeitsch., vol. 15: 460 is a homonym of *Amphibrachium* Schulze, 1880, Trans. Roy. Soc. Edinburgh, vol. 29: 672, and the next valid name available is *Amphibrachella.* The subgenera of *Amphibrachium,* listed by Campbell in Moore (1954: D86) may thus be known as *Amphibrachella* (*Amphibrachella*), *A.* (*Amphibrachidium*), and *A.* (*Amphibrachura*), all of Haeckel, 1887.

Subfamily Flustrellinae Campbell, 1954

Flustrella Ehrenberg, 1839

Subgenus **Discospirella** Loeblich and Tappan, new name

Type species: Discospira helicoides Haeckel, 1862.

The new subgeneric name is proposed for *Discospira* Haeckel, 1862, which was regarded as a subgenus of *Flustrella* Ehrenberg, 1839, by Campbell in Moore (1954: D90). *Discospira* Haeckel, 1862, Die Radiolarien, vol. 1: 513, is a homonym of *Discospira* Mantell, 1850, Pict. Atlas: 142, Foraminifera, and of *Discospira* Semper, 1862, Arch. Ver. Freunde Naturgesch. Mecklenburg, vol. 15: 380, Moll.

Subgenus **Perispirella** Loeblich and Tappan, new name

Type species: Porodiscus perispira Haeckel, 1887.

Perispirella is proposed for *Perispira* Haeckel, 1881, regarded by Campbell in Moore (1954: D90) as a subgenus of *Flustrella* Ehrenberg, 1839. *Perispira* Haeckel, 1881, Jena Zeitschr., vol. 15: 459, is a homonym of *Perispira* Stein, 1859, Lotos, vol. 9, pt. 1: 60, Protozoa, Ciliata.

Superfamily Litheliacea Haeckel, 1862, name transferred

[Lithelida Haeckel, 1862; Litheliidae Campbell, 1954]

The family group name based on *Lithelius* Haeckel, 1862, has priority over the Laracarida Haeckel, 1887, which was elevated to superfamily rank by Campbell in Moore (1954: D95).

Family Pyloniidae Haeckel, 1881

Trizonium Haeckel, 1887

Type species: Echinosphaera datura Hertwig, 1879.

Echinosphaera Hertwig, 1879, was recognized for this taxon by Campbell in Moore (1954: D96) and *Trizonium* Haeckel, 1887, and *Trizonites*

Haeckel, 1887, regarded as objective synonyms. However, *Echinosphaera* Hertwig, 1879, Denkschr. Ges. Jena, vol. 2: 181, is a homonym of *Echinosphaera* Angelin, 1878, Iconog. Crin. Sil.: 28, Echin., and the next available name is *Trizonium* which is here regarded as the valid name.

Superfamily PLAGONIACEA Haeckel, 1881, name corrected

[Plagonida Haeckel, 1881; Plectida Haeckel, 1881; Plectoidea Haeckel, 1887; Plagoniicae Campbell, 1954]

Family Plectaniidae Haeckel, 1881

Subfamily Triplectinae Haeckel, 1881

Deflandrella Loeblich and Tappan, new name

Type species: Campylacantha cladophora Jörgensen, 1905.

The new name is proposed for *Campylacantha* Jörgensen, 1905, in Nordgaard and Jörgensen, Bergens Mus. Hydrogr. Invest.: 129, not *Campylacantha* Scudder, 1897, Proc. Amer. Acad., vol. 32, no. 9: 198, 204, Orth. The genus was recorded as *Campylacantha* Jörgensen by Deflandre in Grassé (1953: 405, 406), by Campbell in Moore (1954: D104) and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 400). *Deflandrella* is named in honor of Professor G. Deflandre, in recognition of his work on the Protozoa.

Plectophorina Loeblich and Tappan, new name

Type species: Plectophora triomma Haeckel, 1887.

The new name is proposed for *Plectophora* Haeckel, 1881, Jena Zeitschr., vol. 15: 424, not *Plectophora* Gray, 1834, Ill. Indian Zool., vol. 2 (pts. 15, 16), pl. 42, Aves. The genus is discussed by Campbell in Moore (1954: D104).

Subfamily Tetraplectinae Haeckel, 1881

Talariscus Loeblich and Tappan, new name

Type species: Obeliscus pseudocuboides Popofsky, 1913.

The new name is proposed for *Obeliscus* Popofsky, 1913, Deutsch. Sudpolar Exped., vol. 14, no. 2: 279, not *Obeliscus* Beck, 1837, Index Moll. Mus. Ch. Fred., vol. 1: 61, moll. and not *Obeliscus* Agassiz, 1845, Nom. Zool. (Moll.): 60, Moll. The genus was described as *Obeliscus* by Campbell in Moore (1954: D104).

Superfamily ACANTHODESMIACEA Hertwig, 1879, name transferred

[Acanthodesmida Hertwig, 1879; Acanthodesmidae Campbell, 1954]

The family group name based on *Acanthodesmia* Müller, 1858, has priority over the Stephida Haeckel, 1881, and Stephanida Haeckel, 1887, and the superfamily Stephaniicae of Campbell in Moore (1954: D105) must be changed to Acanthodesmiacea.

Family Paratympanidae Haeckel, 1881

Subfamily Protympaniinae Haeckel, 1887

Toxarium Haeckel, 1887

Subgenus **Toxidiella** Loeblich and Tappan, new name

Type species: Toxidium cordatum Haeckel, 1887.

The new subgeneric name is proposed for *Toxarium* (*Toxidium*) as described by Campbell in Moore (1954: D109). *Toxidium* Haeckel, 1887, Rep. Voy. *Challenger* Exped., vol. 18, pt. 2: 996 is preoccupied by *Toxidium* Leconte, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 324, Col.

Superfamily ARCHIPILIACEA Haeckel, 1881, name corrected

[Archipilida Haeckel, 1881; Archipiliicae Campbell, 1954]

Family Sethophatnidae Haeckel, 1881, name corrected

[Sethophatnida Haeckel, 1881; Sethophaenida Haeckel, 1887, Sethophatninae Campbell, 1954]

The family group name Sethophormida Haeckel, 1881, is based on *Sethophormis* Haeckel, 1887, a synonym of *Tetraphormis* Haeckel, 1881, hence the oldest family group name based on a valid genus is Sethophatnida Haeckel, 1881. The family Sethophatnidae includes the genera and subfamilies included by Haeckel, 1887, in the Anthocyrtida, by Frizzell and Middour (1951: 8) in the Sethophormidae and by Campbell in Moore (1954: D124–128) in the family Sethophormididae.

Anthocyrtella Haeckel, 1887

Type species: Anthocyrtis mespilus Ehrenbreg, 1854.

Campbell in Moore (1954: D125) and Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 455) refer to this genus as *Anthocyrtis* Ehrenberg, 1847. However, *Anthocyrtis* Ehrenberg, 1847, Monatsber. Akad. Wiss. Berlin, 1847: 54, is a homonym of *Anthocyrtis* Ehrenberg (January 1847), Bericht Verh. preuss. Akad. Wiss., 1846, tab. p. 385, pisces. *Anthocertella* Haeckel, 1887, Rep. Voy. *Challenger* Zool., vol. 18(2): 1269, was regarded as an objective synonym by Campbell but is the next valid name available. *Anthocyrtissa* Haeckel, 1887, and *Anthocyrtura* Haeckel, 1887, were placed as subgenera of *Anthocyrtis* by Campbell in Moore (1954: D126) and may now be considered as *Anthocyrtella* (*Anthocyrtissa*) and *Anthocyrtella* (*Anthocyrtura*) respectively.

Dictyoprora Haeckel, 1881

Type species: Sethamphora hexapleura Haeckel, 1887.

This genus includes the forms previously placed in the genus *Cryptocephalus* Haeckel, 1881, and the subgenera *Cryptocephalus* (*Cryptocephalus*) Haeckel, 1881, and *C.* (*Dictyoprora*) Haeckel, 1881, of Campbell in Moore (1954: D127). The generic name *Cryptocephalus* Haeckel, 1881, Jena Zeitschr., vol. 15: 430, is a homonym of *Cryptocephalus*

Geoffroy, 1762, Hist. Insect. Paris, vol. 1: 231, Col., and of *Cryptocephalus* van Beneden, 1849, Bull. Acad. Roy. Bruxelles, vol. 16, no. 1: 192, Verm. (Cest.). The objective synonym *Sethamphora* Haeckel, 1887, was recognized by Deflandre in Piveteau (1952: 310–311), by Deflandre in Grassé (1953: 426), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 455), but is preoccupied for the genus, s.l., by *Dictyoprora* Haeckel, 1881. The two subgenera thus become *Dictyoprora* (*Dictyoprora*) Haeckel, 1881, and *Dictyoprora* (*Sethamphora*) Haeckel, 1887.

Family Lophophaenidae Haeckel, 1881

Subfamily Lophophaeninae Haeckel, 1881

Dictyocryphalus Haeckel, 1887

Type species: Dictyocephalus obtusus Ehrenberg, 1861.

The generic name *Dictyocryphalus* Haeckel, 1887, was regarded by Campbell in Moore (1954: D128) as an objective synonym of *Dictyocephalus* Ehrenberg, 1861, and this genus was also referred to *Dictyocephalus* by Deflandre in Grassé (1953: 363), and to *Dictiocephalus* by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 456). *Dictyocephalus* Ehrenberg, 1861, Monatsber. Akad. Wiss. Berlin, 1860: 830, is a homonym of *Dictyocephalus* Leidy, 1857, Proc. Acad. Nat. Sci. Philadelphia, vol. 8: 256, Amph. The next available valid name is *Dictyocryphalus* Haeckel, 1887.

Family Theopiliidae Haeckel, 1881

Subfamily Theopiliinae Haeckel, 1881

Lipmanella Loeblich and Tappan, new name

Type species: Lithornithium dictyoceras Haeckel, 1860.

The new name is proposed for *Dictyoceras* Haeckel, 1862, Die Radiolarien, vol. 1: 333, not *Dictyoceras* Eichwald, 1860, Lethaea Ross., vol. 1: 1263, moll. It was recorded as *Dictyoceras* Haeckel by Campbell in Moore (1954: D130), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 402). The generic name is in honor of Professor R. K. Lipman, in recognition of his work on the radiolaria.

Subsuperfamily Stichoperilae Haeckel, 1881, name transferred

Family Stichoperidae Haeckel, 1881, name transferred

[Stichoperida Haeckel, 1881; Stichopilida Haeckel, 1881; Tetracyrtida Haeckel, 1881; Stichocyrtdia Haeckel, 1881; Podocampida Haeckel, 1887; Stichopiliidae Frizzell, 1951; Triacartilae Campbell, 1954; Triacartidae Campbell, 1954; Stichoperinae Campbell, 1954; Triacartinae Campbell, 1954]

Triacartus Haeckel, 1881, is regarded by Campbell in Moore (1954: D136) as including *Stichopilium* Haeckel, 1881, as an objective synonym, and the type is cited as *Stichopilium cortina* Haeckel, 1887. However, Frizzell in Frizzell and Middour (1951: 31–32) regards the two as objective synonyms but designated *Stichopilium bicorne* as type species of both. The family group names based on *Stichopilium* needed replacement and Campbell therefore proposed as new names the subfamily Triacartinae, family Triacartidae, and subsuperfamily Triacartilae. Only the first needed replacement, however, as the family name Triacartidae Campbell, 1954, is preoccupied by the family group name Stichoperida Haeckel, 1881 (= Stichoperinae Campbell, 1954). The subsuperfamily Triacartilae Campbell, 1954, is preoccupied by the Stichoperida Haeckel, 1881, Artophormida Haeckel, 1881 (= Artophormididae and Artophormidinae Campbell, 1954 = correctly Artophormidae), Stichophormida Haeckel, 1881, Stichophatnida Haeckel, 1881 (= Stichophatninae Campbell, 1954), Stichocorida Haeckel, 1881 (= Stichocoridae Frizzell, 1951; Stichocorythidae Campbell, 1954), Lithocampida Haeckel, 1887, Stichocapsida Haeckel, 1881 (= Stichocapsinae Campbell, 1954), and Artocapsida Haeckel, 1881. It is here recognized as subsuperfamily Stichoperilae.

Family Artophormidae Haeckel, 1881

[Artophormida Haeckel, 1881; Artophaenida Haeckel, 1881; Artophormididae Campbell, 1954]

Anthocorys Haeckel, 1881

Subgenus *Cyrtocorys* Haeckel, 1887

Type species: Phormocampe mitra Haeckel, 1887.

Cyrtocorys Haeckel, 1887, was originally an invalidly changed spelling of *Cyrtocoris* Haeckel, 1881, Jena Zeitschr., vol. 15: 438, and thus a junior objective synonym. However, as *Cyrtocoris* Haeckel, 1881, is a homonym of *Cyrtocoris* White, 1842, Trans. Ent. Soc. London, vol. 3, no. 2: 89, Hem., the name *Cyrtocorys* may be used for this taxon. It was referred to *Anthocorys* (*Cyrtocorys*) Haeckel, 1882, by Campbell in Moore (1954: D139), but the spelling as *Cyrtocorys* dates only from 1887.

Family Aulosphaeridae Haeckel, 1862

Subfamily **Campbellellinae** Loeblich and Tappan, substitute name

[Aulonida Haeckel, 1887; Auloniinae Campbell, 1954]

As the type genus of the subfamily Auloniinae is a homonym, here renamed as *Campbellella,* the subfamily name must be replaced by that based on the valid generic name.

Campbellella Loeblich and Tappan, new name

Type species: Aulonia hexagonia Haeckel, 1887.

The new name is proposed for *Aulonia* Haeckel, 1887, Rep. Voy. *Challenger,* Zool., vol. 18, no. 40: 1633, a homonym of *Aulonia* Koch, 1847, Die Arachniden, vol. 14, pt. 3: 97. It was described as *Aulonia* by Campbell in Moore (1954: D150). The generic name is in honor of Professor A. S. Campbell, in recognition of his work on the Radiolaria.

Superfamily CHALLENGERIACEA Murray, 1876, name corrected

[Challengerida Murray, 1876; Challengeriicae Campbell, 1954]

Family **Lirellidae** Loeblich and Tappan, substitute name

As the family Cadiidae Borgert, 1910, is based on *Cadium* Bailey, 1856, a homonym of *Cadium* Link, 1807, the family name must be changed to one based on a valid genus.

Lirella Ehrenberg, 1872

Cadium Bailey, 1856, Amer. Jour. Sci., ser. 2, vol. 22, p. 3. *Type species: Cadium marinum* Bailey, 1856. Fixed by original designation (monotypy); not *Cadium* Link, 1807, Beschr. Nat. Samml. Univ. Rostock, vol. 3, p. 113, Moll.

Difflugia (*Lirella*) Ehrenberg, 1872, Abh. K. Akad. Wiss. Berlin for 1871, p. 248. *Type species:* (here designated) *Lirella baileyi* Ehrenberg, 1872, new name for *Cadium marinum* Bailey, 1856 = *Difflugia* (*Lirella*) *marina* (Bailey) Ehrenberg, 1872, not *Difflugia marina* Bailey, 1856.

?*Eucadium* Ehrenberg, 1872, Abh. K. Akad. Wiss. Berlin for 1871, p. 248. *Type species:* (here designated) *Difflugia* (*Lirella*) *seriata* Ehrenberg, 1872.

Beroetta Cleve, 1899, K. Svenska Vetens. Akad. Handl., vol. 22, no. 3, p. 27. *Type species: Beroetta melo* Cleve, 1899, fixed by original designation (monotypy).

Cadiumella Strand, 1928, Arch. Naturgesch., vol. 92, A8 for 1926, p. 31, new name for *Cadium* Bailey, 1856, not *Cadium* Link, 1807. *Type species: Cadium marinum* Bailey, 1856, objective.

Cadimella Stand, Campbell in Moore, 1954, Treatise on Invert. Paleontology, Pt. D, Protista 3, p. D152. Misspelling of *Cadiumella* and Strand, placed in synonomy of *Cadium* Bailey.

Cadium was described by Bailey in 1856, but was a homonym of *Cadium* Link, 1807, a mollusk, and therefore renamed by Strand in 1928. The homonymy and subsequent renaming has been overlooked by the recent Treatises (Deflandre in Grassé, 1953: 377, and Campbell in Moore, 1954: D152) and the genus recognized as *Cadium.* Campbell even included *Cadiumella* Strand (although generic name and author were both misspelled) and *Beroetta* Cleve, 1899, in the synonomy of *Cadium.*

Although *Cadiumella* was proposed as a substitute name for the homonym *Cadium,* it is preoccupied by *Beroetta* Cleve, which has long been regarded as congeneric (Borgert, 1910, Ergebnisse Plankton-Exped., Humboldt Stiftung, Kiel and Leipzig, vol. 10: 384–414). Furthermore, in 1872 Ehrenberg discussed *Cadium marinum* Bailey in connection with numerous other protozoans, many of which he regarded as belonging to *Difflugia* although now placed in many different genera, families and orders. He described a number of subgenera of *Difflugia,* one of which

Difflugia (*Lirella*) included three species in the original list. One of these was *Lirella baileyi*, new name for *Cadium marinum* Bailey, 1856, because Ehrenberg considered this a homonymous species, as he placed *Difflugia marina* Bailey (possibly = *Paraquadrula*) and *Cadium marinum* Bailey in the same "genus." This congeneric status has not since been accepted by any later workers, because *Difflugia marina* Bailey belongs to the Rhizopodea (Arcellacea) whereas *Cadium marinum* Bailey is a Radiolarian. Thus there is no true homonymy and species *Lirella baileyi*, here designated as type species of *Lirella* Ehrenberg, is an objective synonym of *Cadium marinum*. The genus therefore should be referred to *Lirella*, and the type species *Lirella baileyi* Ehrenberg = *Cadium marinum* Bailey. *Eucadium* was also proposed by Ehrenberg, with two species originally included, of which *Difflugia* (*Lirella*) *seriata* Ehrenberg is here designated as type.

Subclass ACANTHARIA Haeckel, 1862

Superfamily ASTROLONCHACEA Haeckel, 1881, name corrected

Family Astrolonchidae Haeckel, 1881

Subfamily Astrolonchinae Haeckel, 1881

Dipelicophora Loeblich and Tappan, new name

Type species: Dicranophora buetschlii Schewiakoff, 1926.

New name proposed for *Dicranophora* Schewiakoff, 1926, Fauna e Flora Golfo di Napoli, vol. 37: 163; not *Dicranophora* Macquart, 1834, Roret's Suite à Buffon, Diptères, vol. 1: 255 (Diptera). For discussion see Deflandre in Grassé (1953: 304) and Campbell in Moore (1954: D34).

Superfamily Dorataspacea Haeckel, 1862, name corrected

Family Dorataspidae Haeckel, 1862, name corrected

[Dorataspida Haeckel, 1862; Dorataspididae Campbell, 1954]

Orophaspis Haeckel, 1881

Orophaspis Haeckel, 1881, Jena. Zeitschr., vol. 15: 468.

Stegaspis Haeckel, 1881, Jena. Zeitschr. vol. 15: 468; objective; not *Stegaspis* Germar, 1833—Hem.

Type species: Orophaspis diporaspis Haeckel, 1887.

Campbell (1954: D37) recognizes *Stegaspis* Haeckel, with *Orophaspis* regarded as an objective synonym. *Orophaspis* is the valid name, as it has priority and, because *Stegaspis* Haeckel is a homonym.

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NEW VENEZUELAN LEAFHOPPERS OF THE SUBFAMILIES XESTOCEPHALINAE AND NEOCOELIDIINAE (HOMOPTERA: CICADELLIDAE)

By James P. Kramer

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This paper adds three new species to the genus *Portanus* reviewed by Linnavuori (1959. Ann. Zool. Soc. 'Vanamo' 20(1): 45–51), and a new genus and species to the Neocoelidiinae reviewed by DeLong (1953. Lloydia 16(2): 93–131). All of the material treated in this paper will be deposited in the collection of the United States National Museum.

The new species described herein were collected by my friend and colleague, J. Maldonado Capriles of the University of Puerto Rico, College of Agriculture, Mayaguez, Puerto Rico. The collection, although small, contained some most interesting forms from several localities in Amazonas Territory, Venezuela, an area where the cicadellid fauna is almost unknown.

XESTOCEPHALINAE

Portanus linnavuorii, new species

Length: Male 5.2 mm.

Coloration: Color and markings indistinguishable from *P. boliviensis* (Baker) treated by Linnavuori (pp. 50–51).

Male genitalia: Connective elongated and Y-shaped; style slender with both apical lobes well developed (Fig. 13). Aedeagus (Fig. 14) similar to that of *boliviensis* (Linnavuori, Fig. 20B) but differing from it as follows: The aedeagal apex is entire, not trifid, and the finely toothed dorsal projection is large. Like *boliviensis,* the dorsal portion of the aedeagus is membranous.

Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Tapara, 20 April 1950, J. Maldonado Capriles. USNM type no. 64881. Female unknown.

Comparative note: This species is very close to *boliviensis,* but it is larger and differs in the characters of the aedeagus.

Portanus facetus, new species

Length: Male 5.7 mm.

Coloration: Venter and legs stramineous. Face stramineous with a brown stripe along each lateral margin of clypeus extending on to clypellus and fading out. Crown bright orange with exceedingly minute red dots. Two subtriangular dark brown spots partially surround the marginal red ocelli. These spots meet at midline of crown and extend caudad as a single stripe or two very narrow stripes meeting the dark coronal suture. Angle formed by margin of eye and posterior margin of crown, dark brown. Pronotal ground color brown, but with numerous small colorless oval or elongate-oval spots. Scutellum bright orange with anterior angles broadly dark brown, also with mesal broad dark brown stripe which fades before apex. Ground color of forewings brown hyaline with veins darker, especially in anterior costal area. Apex of forewings at times smoky brown. Claval commissure narrowly bright orange with obvious spot of same color before claval apex. Area of clavus next to the narrow bright orange commissure, dark brown. This dark brown area could be interpreted as a stripe running from each anterior angle of the scutellum on to the forewings and along the claval commissure being interrupted by a bright orange spot before attaining the claval apex.

Male genitalia: Pygofer with ventral margin greatly thickened (Fig. 8). Connective Y-shaped, clearly articulated to aedeagus, with forked distal flap (Fig. 7). Mesal lobe of style curved laterad, lateral lobe broad and blunt (Fig. 7). Aedeagus elongated with pair of long apical processes directed ventrally (Fig. 5). Gonopore opens ventrally near apex (Fig. 6).

Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Tapara, 20 April 1950, J. Maldonado Capriles. USNM type no. 64880. Paratype male, some data except Juiian, 28 April 1950. Female unknown.

Comparative note: This species and *elegans* are the only members of the genus with bright orange markings. It is easily distinguished from *elegans* on the basis of markings. In *facetus* the pronotum lacks orange spots, the dark brown markings between the eyes consist of a pair of irregular triangles, and the clypeus lacks reticulated markings. The many differences in the male genitalia will separate the species as well.

Portanus elegans, new species

Length: Male 5.5–5.7 mm.

Coloration: Venter, legs, and face as in *facetus* except for additional weakly defined brown stripes on face extending on each side from antennal base along lorum to apex of each gena, and brown reticulated markings on upper half of clypeus. Crown bright orange with broad,

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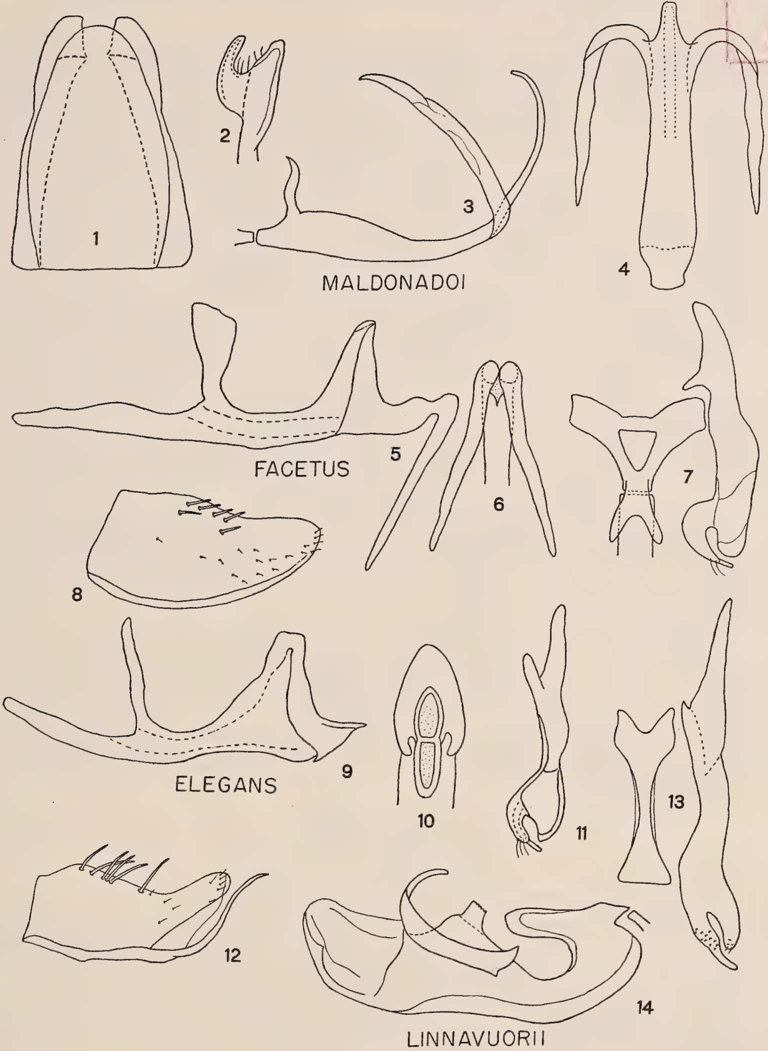

FIGS. 1–14. Figs. 1–4, *Deltocoelidia maldonadoi.* 1.—ventral view of genital capsule. 2.—apical portion of style ventrally. 3.—lateral view of aedeagus. 4.—ventral view of aedeagus. Figs. 5–8, *Portanus facetus.* 5.—lateral view of aedeagus. 6.—ventro-apical portion of aedeagus. 7.—dorsal view of connective and style. 8.—lateral view of pygofer. Figs. 9–12, *P. elegans.* 9.—lateral view of aedeagus. 10.—ventro-apical portion of aedeagus. 11.—dorsal view of style. 12.—lateral view of pygofer. Figs. 13–14, *P. linnavuorii.* 13.—ventral view of connective and style. 14.—lateral view of aedeagus. Note: Drawings made at various magnifications from holotypes.

dark brown, interrupted, transverse band between anterior margins of eyes, band touches marginal red ocelli but does not touch eyes. At the middle, the band projects caudally as a sharp marking meeting the coronal suture. Band broken medianly by narrow longitudinal orange area. Additional pair of narrow brown stripes originating from posterior margin of crown on either side of coronal suture. These stripes diverge anteriorly and reach almost to the transverse band. Pronotum as in *facetus* except for pair of elongate bright orange spots. Scutellum pale with a few brown markings and an orange spot at middle of each lateral margin. Forewings brown hyaline with veins mainly dark brown, and an irregular brown marking across base of anteapical cells. Clavi marked as in *facetus* except orange area slightly wider.

Male genitalia: Pygofer with long slender ventral process curved dorsally (Fig. 12). Connective as in *facetus.* Style similar to *facetus* but less robust and with comparative differences (Fig. 11). Aedeagus resembles that of *facetus* but shorter, and lacks long apical processes (Fig. 9). Gonopore opens ventrally (Fig. 10).

Holotype: Male, Venezuela, Territory Amazonas, Culebra N. Duida, 1–4 July 1950, J. Maldonado Capriles. USNM type no. 64879. Two paratype males: One, same data except Upper Cunucunuma, Julian, 28 April 1950; another, same data except Upper Cunucunuma, Tapara, 20 April 1950. Female unknown.

Comparative note: The only species with which elegans might be confused is *facetus.* It is easily distinguished from *facetus* by the orange spots on the pronotum, the dark brown band on the crown between the anterior margins of the eyes, and the brown reticulated markings on the upper half of the clypeus. The many differences in the male genitalia are distinctive also.

NEOCOELIDIINAE

Deltocoelidia, new genus

Type species: Deltocoelidia maldonadoi new species

In DeLong's key to genera (pp. 94–95), this new genus would trace to *Stenocoelidia.* Like *Stenocoelidia, Deltocoelidia* lacks a carina between the face and crown; unlike *Stenocoelidia,* the pygofer lacks a ventral tooth, the aedeagus has paired lateral processes, and the valve and male plates are solidly fused and appear as a single plate on the venter of the genital capsule. The clypellus is slightly tumid, and the venation of the forewings is undiscernible except in the clavus and at the apex.

Deltocoelidia maldonadoi, new species

Length: Male 6 mm, female 6.5 mm.

Coloration: Venter, legs, and face stramineous. Crown, pronotum, and scutellum with ground color stramineous; wide cherry-red, median, longitudinal stripe running from apex of crown to base of pronotum. Stripe constricted at the middle of crown and widest at pronotal base, may extend on to scutellum where it fades out. Forewings stramineous hyaline marked as follows: clavus with moderately broad, red stripe running along scutellum and commissural margin, two dark brown spots flank stripe in clavus, third brown spot occurs just outside of claval apex with fourth spot directly behind it. These four spots in each wing are approximately linear in arrangement.

Male genitalia: Pygofer without processes or hooks. Valve and plates fused, appearing as single ventral covering for genital capsule (Fig. 1). Connective Y-shaped, largely membranous, and articulated with aedeagus. Styles long and slender with apical lobes well developed (Fig. 2). Aedeagus slender and recurved apically, a pair of moderately heavy lateral processes arising on distal portion of the shaft (Figs. 3–4).

Female genitalia: Pregenital sternite of female broadly and shallowly concave.

Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Juiian, 28 April 1950, J. Maldonado Capriles. USNM type no. 64882. Two female paratypes same data except Mount Marahuaca, northern slopes, Benitez Camp. 1–25 May 1950.

Comparative note: The male genitalia are unique and readily distinguish the species. The color pattern in the type is faded so that the red claval stripe is just discernible.

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THE STATUS OF *HAGENOWELLA* CUSHMAN, 1933 AND A NEW GENUS *HAGENOWINA*

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The genus *Hagenowella* was originally described by Cushman (1933, p. 21) as having a trochoid spire, with vertical radial internal partitions projecting from the outer wall and partially subdividing the chambers. The genus was monotypic, and the type species designated as *Valvulina gibbosa* d'Orbigny, 1840. Marie (1941, p. 41) noted that this description had been based on misidentified material as it was not conspecific with the *V. gibbosa* of d'Orbigny.

The original specimens of *Valvulina gibbosa* d'Orbigny, from the Craie Blanche of Saint-Germain, France (designated as type species of *Hagenowella* by Cushman) were restudied in Paris by Marie. He stated that the type slide contained two specimens, a composite of these being the basis for d'Orbigny's type figures. The small globular specimen, which was drawn by d'Orbigny for the general form of the test was stated by Marie to be doubtful, but possibly an *Ataxogyroidina* [= *Ataxophragmium*] or a *Globigerina elevata* d'Orbigny, 1840 [a species Marie transferred to the genus *Hagenowella*]. The other larger specimen Marie stated to be an *Arenobulimina* with abnormal final chamber, apparently the basis for the representation of the aperture, although modified, in d'Orbigny's figures. Marie stated that the French specimens did not have an apertural tooth and did not have internal partitions, as did the specimens figured and described by Cushman. Marie then stated that *Valvulina gibbosa* should be rejected as type species and proposed that *Globigerina elevata* d'Orbigny, 1840 be made the type of *Hageno-*

wella. Unfortunately, the type species cannot be changed by later workers, hence the type must remain *Valvulina gibbosa*. On the basis of the original specimens of the type species, *Hagenowella* Cushman, 1933 becomes a synonym of *Arenobulimina* Cushman, 1927.

The specimens figured by Cushman as *Hagenowella gibbosa* (1933, Pl. 1, Figs. 1–3) were not identified as to exact locality, but specimens were stated (Cushman, 1933, p. 21) to have been obtained from "the Senonian of the Island of Rügen, in the Craie Blanche of the Paris Basin, and from the Chalk of England." In a later publication (Cushman, 1937, Pl. 21, Figs. 1, 2), the same illustrations were used, and then stated to be from the Cretaceous of France. An examination of the types in the Cushman Collection by the writers showed this last statement to be in error, as the figured specimens (Cushman Coll. 21213) are labelled from Upper Cretaceous (Senonian), Island of Rügen, Germany. These internally partitioned forms thus are not conspecific with *Valvulina gibbosa*. The French species with simple interior is correctly referred to *Arenobulimina*, and the German one should be referred to *Valvulina quadribullata* von Hagenow (a species described from Rügen and erroneously regarded by Cushman as a synonym of *V. gibbosa* d'Orbigny).

As *Hagenowella* is a junior synonym of *Arenobulimina*, the species with internal partitions requires a new generic name.

Family Ataxophragmiidae Schwager, 1877

Subfamily Ataxophragmiinae Schwager, 1877

Hagenowina Loeblich and Tappan, new genus

Hagenowella Cushman, 1933, Amer. Jour. Sci., ser. 5, v. 26, p. 21 (part, including *Hagenowella gibbosa* (d'Orbigny) of Cushman, not *Valvulina gibbosa* d'Orbigny).

Type species: Valvulina quadribullata von Hagenow, 1842.

Test trochospiral, with three or more chambers per whorl; interior of chambers subdivided by partial radial partitions projecting inward from the outer wall as in *Ataxophragmoides*; aperture an interiomarginal slit or loop with an indistinct tooth.

Range: Upper Cretaceous (U. Senonian or Maestrichtian).

Remarks: The present genus includes forms included by Cushman in *Hagenowella*, but does not include *Valvulina gibbosa* d'Orbigny, the type species of *Hagenowella*, which has been shown to have simple, nonsubdivided chambers. The specimens referred to *Hagenowella gibbosa* by Cushman (1933, Pl. 1, Figs. 1–3; 1937, Pl. 21, Figs. 1, 2) are in the U. S. National Museum (Cushman Coll. No. 21213) and are from the Upper Cretaceous (Upper Senonian), Island of Rügen, Germany. They should correctly be referred to *Valvulina quadribullata* von Hagenow = *Hagenowina quadribullata* (von Hagenow).

SUMMARY

Hagenowella Cushman, 1933, was based on specimens misidentified as *Valvulina gibbosa* d'Orbigny, 1840. As *Valvulina gibbosa* has simple, nondivided chambers, *Hagenowella* is a junior synonym of *Arenobulimina*. *Valvulina quadribullata* von Hagenow includes the specimens with vertical internal partitions identified as *Valvulina gibbosa* by Cushman and is here made the type species for the new genus *Hagenowina*.

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A NEW SUBSPECIES OF WARBLER FROM CERRO DE LA NEBLINA, VENEZUELA, AND NOTES

By William H. Phelps and William H. Phelps, Jr.

Further research in our collection shows that our expedition of 1954 to the newly discovered Cerro de la Neblina in the extreme southwestern part of Venezuela, near where Brazil, Colombia and Venezuela meet, collected the following new subspecies of Parulidae.

The extension of range to Venezuela of the rare genus *Coturnicops* (Rallidae) is noted and a second record for South America of *Vermivora leucobronchialis,* hybrid, is listed. We wish to thank the Curator of Birds in the American Museum of Natural History for access to that collection.

Specimens listed are in the Phelps Collection, Caracas, unless otherwise indicated. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

Coturnicops notata duncani (Chubb)

Ortygops notata duncani Chubb, Bds. Brit. Guiana, *1*, p. 74, Pl. 3, Fig. 2, 1916. (Abary River, British Guiana; type in British Museum.)

One female, "Mérida," collected by Gabaldón 24 June 1916. Specimen in the American Museum of Natural History.

This specimen constitutes an extension of range of the genus from British Guiana to Venezuela. The locality "Mérida" of Gabaldón would not necessarily indicate a Subtropical Zone locality.

This well-marked subspecies was hitherto known only by the type in the British Museum. Not only is *duncani* an excessively rare bird but Hellmayr and Conover (Bds. Americas, Pt. 1, No. 1, p. 389, 1942) give the range of the nominate race *notata* as Uruguay and Argentina and say "The Masked Rail is one of the rarest neotropical birds."

This Venezuelan specimen has not been compared with the type of *duncani* but it is similar to the colored plate of Chubb in the original description and quite different from *notata* in the American Museum of Natural History from Hamburgo Velho, Rio Grande do Sul, Brazil.

Vermivora chrysoptera × *Vermivora pinus* = *Vermivora leucobronchialis* (Brewster). Hybrid.

Hellmayr (Bds. Americas, etc., 8, p. 336, 1935) records a specimen from Valle, Mérida, that presumably is the only record from South America up to date. We have a specimen collected at Río Chiquito, western Táchira, 20 February 1956, in a forest at 1,800 meters altitude.

Myioborus brunniceps maguirei, new subspecies

Type: From Cerro de la Neblina, Territorio Amazonas, Venezuela; 1,850 meters. No. 60274, Phelps Collection, Caracas. Adult male collected 20 January 1954 by Ramón Urbano. (Type on deposit at American Museum of Natural History.)

Diagnosis: Nearest to *M. brunniceps castaneocapillus* (Cabanis) of Mount Roraima and the other mountains of the Gran Sabana, Bolívar, from which it differs in having the gray of forehead less extensive, the breast more lemon yellow, without the orange tint; and the white eye-ring more prominent. Differs from *M. b. duidae* Chapman, of mounts Duida, Parú, and Huachamacari, by yellow instead of orange underparts.

Range: Known from Cerro de la Neblina, near the extreme southwestern part of Territorio Amazonas in low forest and bushes at altitudes between 1,800 and 1,850 meters.

Description of type: Crown, Sanford's Brown; forehead, lores and sides of head grayish black; orbital ring white; back and uropygium nearest to Citrine. Chin white; throat, breast, sides and abdomen Lemon Chrome; under tail-coverts white. Wings, Fuscous; bend of wing, under wing-coverts and axillaries mixed brownish and whitish. Tail, Fuscous, outermost rectrices white with Fuscous basally on inner webs; second ones with less white; third ones only apically with white; and the fourth ones only with white tips.

Bill (in life) "brownish-black"; feet "brown," under surface of toes yellowish; iris "brown." Wing, 64 mm; tail, 64; exposed culmen, 10; culmen from base, 13; tarsus, 20.

Remarks: Sexes alike in color, female with shorter wing. Size similar to *castaneocapillus.* Range of measurements: five adult males (inc. type)—wing, 64–66 (64.6) mm; tail, 63–67 (64.7); culmen from base, 13–14 (13.8); three adult females—wing, 60–63 (61); culmen from base, 14–14 (14). Measurements of *castaneocapillus*: five adult males—wing, 63–66 (64.2); tail, 58–62 (60.4); culmen from base, 13.5–14 (13.9); five adult females—wing, 60–62 (61.2); tail, 57–60 (59); culmen from base, 13–14 (13.8).

It gives us great pleasure to dedicate this new bird to Dr. Bassett Maguire, explorer extraordinary, Curator in the New York Botanical Garden, who, in his exploration of Cerro de la Neblina, facilitated our access to the upper reaches of the mountain where this bird has its habitat.

Specimens examined: M. b. castaneocapillus—VENEZUELA: Bolívar, in the Gran Sabana region, mounts: Roraima, 13 ♂, 11 ♀, 5 (?); Cuquenán, 9 ♂, 6 ♀, 5 (?); Ptari-tepui, 6 ♂, 3 ♀, 6 (?); Soropán-tepui, 1 ♀, 3 (?); Chimantá-tepui, 5 ♂, 7♀, 7 (?); Uaipán-tepui, 4 ♂, 5 ♀, 7 (?); Aprada-tepui, 8 ♂, 4 ♀, 3 (?); Acopán-tepui, 3 ♀, 4 (?); Uei-tepui, 8 ♂, 4 ♀, 4 (?); Arabopó, 1 (?). *M. b. duidae*—VENEZUELA: Terr. Amazonas, mounts: Duida, 2 ♂, 1 ♀; Parú, 11 ♂, 7 ♀, 4 (?); Huachamacari, 7 ♂, 4 ♀, 1 (?). *M. b. maguirei*—VENEZUELA: Terr. Amazonas, Cerro de la Neblina, 5 ♂ (inc. type), 3 ♀, 2 (?).

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THE COLLARED LEMMING (*DICROSTONYX*) FROM THE PENNSYLVANIA PLEISTOCENE

By John E. Guilday and J. Kenneth Doutt
Carnegie Museum

Excavations at sinkhole no. 4, 1.5 miles northeast of New Paris, Bedford County, Pennsylvania (lat. 40° 7′ N, long. 78° 37′ W, alt. 1,500 feet) by Carnegie Museum/National Speleological Society field parties have added many new species to the poorly known late Pleistocene fauna of the state. These include *Pedioecetes phasianellus, Citellus tridecemlineatus, Synaptomys borealis, Phenacomys* cf. *ungava, Microtus xanthognathus,* and the extinct *Eptesicus grandis, Tamiasciurus tenuidens* and *Mylohyus pennsylvanicus.* A Carbon 14 date, from flakes of charcoal in the associated matrix, of 11,300 ± 1000 Before Present was obtained by Yale University, sample no. Y-727. The fauna post-dates the maximum extension of the Wisconsin glaciation.

Matrix from the 20-foot level excavated 21 October 1960 was washed and screened to recover bones and teeth of the smaller forms on 16 June 1961. A fragmentary maxilla bearing M^1 and M^2 and a right and left mandible with complete dentition (Carnegie Museum Section of Vertebrate Fossils Catalog Number 6258) were recovered from the same washing screen. They are probably parts of a single individual. We have identified them as *Dicrostonyx hudsonius* (Pallas). Dental distinctions as discussed by Miller (N. A. Fauna, 1896, no. 12, p. 39) and Hall & Kelson (Mamm. of N. A., 1959, pp. 765, 767), and direct comparison with specimens of *D. hudsonius* (Pallas) from Ungava and *D. groenlandicus* (Traill) from the Mackenzie River delta, N. W. T. in the collections of Carnegie Museum, make it apparent that the Pennsylvania specimens are indistinguishable from modern *D. hudsonius* in all characters of the dentition. They differ from *D. groendlandicus* in just those points that distinguish the latter from *D. hudsonius.* Cursory inspection of two mandibles of *D. torquatus* (Pallas) from the Pleistocene of Poland lead us to believe that *D. torquatus* and *D. groenlandicus* may be more closely related than either is to *D. hudsonius.* The discovery of what was ostensibly a form endemic to the tundra of northern Quebec and Labrador, 1,200 miles to the south during the late Pleistocene presents an interesting problem in speciation and Pleistocene zoogeography which we hope to pursue further in the near future. The excavation of sinkhole no. 4 is incomplete at the present writing. We have reason to believe that more *Dicrostonyx* material will be recovered as excavation proceeds deeper.

This is the first record of an unequivocal tundra rodent from the Pleistocene of the Appalachian Mountain region. *Dicrostonyx* is known from the Pleistocene of Europe but has not heretofore been recovered from the North American Pleistocene to our knowledge.

We wish to thank W. Galen Barton, Ralph C. Bossart, Mr. and Mrs. Harold Hamilton, John A. Leppla, Allen D. McCrady, and those members of the Pittsburgh Grotto, National Speleological Society, whose untiring work at the site made this discovery possible. We are also indebted to the A. W. Mellon Educational and Charitable Trust for financial assistance.

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AUSTROTYLA, A NEW MILLIPED GENUS (CHORDEUMIDEA: CONOTYLIDAE: CONOTYLINAE)

By Nell B. Causey
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Introduction: The genus *Austrotyla* is proposed for four species formerly included in the genus *Conotyla*: *coloradensis, humerosa, montivaga,* and *specus*.

Sixteen species have been assigned by various authors (Loomis, 1943; Chamberlin and Hoffman, 1958) to the genus *Conotyla*. The sternal regions of the gonopods of these species have rarely been described, and consequently forms with widely divergent generic characters have been brought together. As now conceived, *Conotyla*, with its junior synonym *Proconotyla* Verhoeff, 1932, is restricted to forms in which the sternum of the anterior gonopods is bandlike; the anterior gonopod is small, simple, inconspicuous, composed of one fused piece, free from its homologue in the coxal region, and it either clutches or entwines about some part of the posterior gonopod; the coxal endite of the posterior gonopod is larger and stouter than the anterior gonopod and sometimes complex on the caudal surface. The characters that quickly distinguish *Austrotyla* from *Conotyla* are the slightly smaller body and the anterior gonopods, which are larger and more conspicuous than the largely membranous coxites of the posterior gonopods. The ranges of these two genera overlap partially in the Middle Western States; species of *Austrotyla* tend to have a wider and more southern and western distribution than species of *Conotyla*. In each genus there are both epigean and troglobitic species.

The form of the sternum of the anterior gonopods of two very incompletely described conotylinid genera, *Cookella*

Chamberlin, 1941, and *Zygotela* Chamberlin, 1951, is not known. With but one exception, the alleged presence of a "small, broadly triangular promentum," the somatic characters of the type species of *Cookella, Cleidogona leibergi* Cook and Collins, 1895, closely resemble those of *Austrotyla.* I have not seen the female syntypes, and Chamberlin did not state that he had seen them when he proposed the genus *Cookella,* with the chief diagnostic character the presence of a promentum. I know of no conotylid with a promentum. The definitive characters of *Zygotela* are unknown, since the type species is based on a larval male.

Acknowledgments: I am grateful to Herbert W. Levi, who loaned the holotype of *Conotyla montivaga* and the large Colorado collection of conotylids made by him and Mrs. Levi; to H. F. Loomis, who called my attention to some of the discrepancies in the description of *Conotyla coloradensis*; and to each of the following, who also collected specimens that were studied in the preparation of this paper: T. C. Barr, Jr., Richard E. Graham, Oscar Hawksley, C. C. Hoff, and M. W. Sanderson.

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Austrotyla, new genus

Type species: Conotyla specus Loomis.

Distribution: Caves and epigean sites from the upper Mississippi Valley westward to Arizona and northeastern California (Fig. 1).

Diagnosis: Medium size, pigmented (unless troglobitic) conotylinids of 30 body segments in which L-shaped sternites form conspicuous lobes on the ectal margin of the anterior gonopods. Anterior gonopods stouter and more conspicuous than the coxal endites of the posterior gonopods. Nearest *Taiutyla* Chamberlin, 1952, in which the sternites of the anterior gonopods are oval and widely separated but are not ectal to the gonopods.

Description: Body 9 to 21 mm long, 0.9 to 1.7 mm wide, of even width from about segment 4 to segments 20 or 23. Typical body color of preserved specimens: medium to dark brown above and light tan below; metatergites darker than protergites, which often are gray; indistinct tan maculae on the shoulders and the prozonites; a thin middorsal, longitudinal tan suture extends from the middle of the collum through the penult segment; dorsum never with distinct longitudinal brown bands as in *Conotyla*; base of legs light tan; distal half of legs and antennae brown.

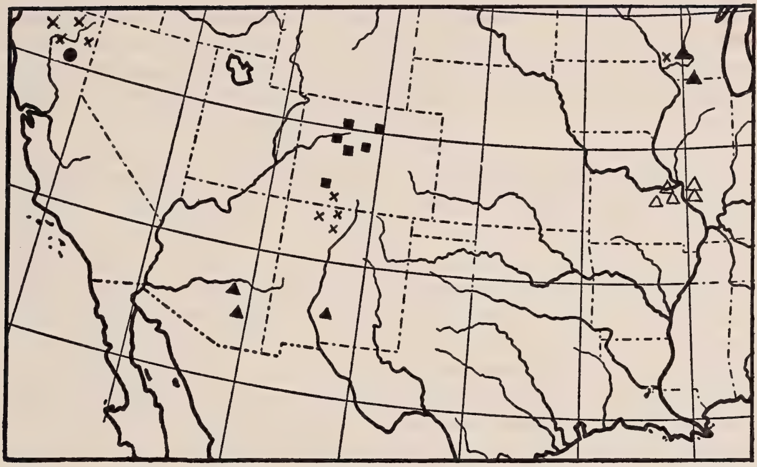


FIG. 1. Map showing the distribution of the species and subspecies of *Austrotyla* in the United States. Symbols: square, *A. coloradensis*; dot, *A. humerosa*; open triangle, *A. specus specus*; solid triangle, *A. specus montivaga*; ×, females and larvae of undetermined species.

No promentum; the small triangular space between the anterior margin of the mentum and the base of the lingual laminae is covered by a membrane that when wet resembles a sclerite. Ocelli dark brown or black; in *specus* and *coloradensis* there are from 20 to 25 dark brown or black, rarely contiguous ocelli on a brown background arranged in 4 or 5 straight or curved rows in a triangular or subtriangular area with slightly convex sides; one ocellus is out of line on the ectocaudal angle; in the *humerosa* group there are from 7 to 10 brown ocelli, mostly contiguous and arranged in two very irregular horizontal rows on a depigmented background. Antennae very slender and long to slightly clavate and shorter, article 3 longest, and article 4 slightly bent at the base.

Body surface shining; surface of metatergites minutely reticulated and margins minutely beaded; protergites more coarsely reticulated and crossed by one distinct and one indistinct transverse ridge; metapleurites minutely and obliquely striated; a single large submarginal stria crosses the metapleurites obliquely from the ventral margin to the posterior margin.

The width of the collum is slightly more than twice its length, except in *humerosa* where the ratio is 8/5; the anterior margin is semicircular and the posterior margin is either straight or very slightly concave; a weak stria is parallel with the anterior margin. Paranota are on segments 2 through 25 or 26; viewed from above, the ectocephalic margin of typical paranota is rounded and the caudal margin is nearly straight (Fig. 9). The paranota are either well below the dorsal body surface (*specus*, *coloradensis*) or even with it (*humerosa*). The segmental setae are acute and set on conspicuous nodules, which on typical segments are arranged as shown in Figure 9; length of longest setae approximately one-third the body width. Shape of caudal segment and arrangement of setae as in *Conotyla.*

Leg pairs 1 and 2, composed of 6 segments, are about two-thirds the length of the following legs; the ventral surface of the tarsal segments bears stiff, dense setae. The other legs are composed of 7 segments. In the male, leg pairs 3 through 7 are slightly shorter and thicker than the postgonopodal legs, and segment 4 of 2 or more of them bears conical or cylindrical lobes on the mesial surface; the size of the lobes is either constant or variable for a species but the arrangement is constant; the tarsal surface of leg pairs 3 through 7 or 11 is pulvillar; leg pair 10 has coxal glands that are seldom everted, and in one species, *specus,* there is an anteriorly directed, nipplelike coxal lobe; leg pair 11 has no coxal glands; segment 3 of leg pair 10 bears a lobe in *humerosa.*

The anterior gonopods curve back over the coxae of the tenth or eleventh legs and are contiguous in the midline, covering the coxal endites of the posterior gonopods. The gonopod is an elongated unsegmented piece smooth on the ventral surface and more or less complex on either the dorsal surface or the mesial margin. It is larger, more heavily sclerotized, and more conspicuous than the coxal endite of the posterior gonopod. At the base, it is separated by a distinct suture from its homologue. The two L-shaped sternites are attached to the ectocephalic angles of the gonopods; the vertical branches of the sternites, which appear as conspicuous lateral lobes that quickly distinguish this genus from any other, are attached either at one point on the ectal margin of the gonopod (*coloradensis*) or all along the basal half of the ectal margin (other species). The spiracle is lateral and difficult to see. The space anterior to the anterior gonopods is filled by a band of transversely striated surface chitin.

The sternum of the posterior gonopods is a weak transverse band; the sternal apodemes are about as long as the coxal endites. The joints between the sternum, coxa, and prefemur are sometimes difficult to see, and it is doubtful whether all of them are movable in any species. The coxosternal joint reaches either to or almost to the midline; a small pore opens on the mesioventral surface of the coxa. The coxal endite arises mainly from the caudal, mesial, and cephalic margins; it is somewhat cuplike and open cephalad or ventrad; it is either entirely membranous or it is partly membranous and partly sclerotized; the shape of the margin varies a little within a species. The second segment, the prefemur, is either markedly clavate (*humerosa*) or only slightly clavate distad (other species). The ovate third segment, the femur, is 2 to 4 times as long as it is thick; it has no terminal spine, but there is usually an irregular brown spot on the apex. The prefemur is either markedly shorter than or slightly longer than the femur.

Classification: Austrotyla is diphyletic. The somatic characters of the *humerosa* group are possibly different enough from the *specus-montivaga* group to warrant the establishment of a separate subgenus. The sternal region of the anterior gonopods is certainly too similar in the two groups to permit generic rank for each.

In addition to the marked specific differences in the anterior gonopods, there are specific differences in the shape of each segment of the posterior gonopods, the size of the body, the size and position of the paranota, the length and thickness of the antennae, the eyes, and the lobation of the legs.

Number of species: Three, of which one is represented by two subspecies; a key is given in the next paragraph. It is possible that *Scoterpes wyandotte* Bollman, 1888, will go in *Austrotyla* also. I have not seen this species, which is still known from only one female specimen (Crawford Co., Indiana, U. S. Nat. Mus., No. 440). The convex posterior margin of the collum and the short body are characters of *Austrotyla* rather than of *Conotyla,* the genus to which Cook and Collins (1895) assigned it. The report of *wyandotte* from Michigan by Johnson (1954, The millipeds of Michigan, Michigan Acad. of Sci., Arts, and Letters, 39: 241–252) needs confirmation.

KEY TO THE GENUS *AUSTROTYLA* BASED ON THE MALE

1. Troglobitic; depigmented; length 17 to 21 mm; 7 to 10 ocelli in an irregular horizontal patch; paranota elevated to the level of the dorsum; lobes on segment 4 of leg pairs 5, 6, and 7. Anterior gonopod: apex attenuated, ending in a hook; with from 4 to many stiff, slender processes on the mesial margin. Posterior gonopod: prefemur clavate distad; length of prefemur and femur almost equal .... *humerosa* group

   Mostly epigean and pigmented; length 9 to 17 mm; 19 to 25 ocelli in a triangular patch; paranota placed well below the level of the dorsum; lobes on segment 4 of leg pairs 3 and 4. Anterior gonopod: apex either narrow or broad, rounded; dorsal surface with sclerotized or setose lobes. Posterior gonopod: prefemur very slightly clavate distad; femur markedly longer than prefemur 2

2. Without a lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to only one point of the ectal margin of the gonopod. Posterior gonopod: coxal endite quadrate from a caudal view; ratio of length to thickness of femur 4/1 .. *coloradensis*

   With an anteriorly directed lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to the proximal half of the ectal margin of the gonopod. Posterior gonopod: coxal endite triangular from a caudal view; ratio of length to thickness of femur 3/1 3

3. Troglobitic; white to pale brown; length 13 to 15 mm; ratio of the length of articles 3 and 4 of the antennae approximately 4/3 .... *specus specus*

Epigean; medium to dark brown; length 9 to 13 mm; ratio of the length of articles 3 and 4 of the antennae approximately 4/2 .... *specus montivaga*

Austrotyla coloradensis (Chamberlin, 1910), new combination
Figs. 2–4

Conotyla coloradensis Chamberlin, 1910, Ann. Ent. Soc. Amer., 3(4): 237, Pl. 32, Figs. 8, 9; Pl. 33, Figs. 1–3. Cockerell, 1911, Univ. Colorado Studies, 8: 249. Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 42(7): 382. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 98.

Female holotype (present location unknown) originally stated to be from Colorado was later reported (Cockerell, 1911) as having been collected at Salina, Boulder County, Colorado. A male, collected 4 miles north of Allen's Park, Boulder County, 20 July 1959, by H. W. Levi, has been designated as the neotype (Museum of Comparative Zoology) and described here.

Range: The southern Rocky Mountains of Colorado, including the following counties: Boulder, Chaffee, Eagle, Gilpin (Cockerell, 1927), Gunnison, Hinsdale, and Pitkin.

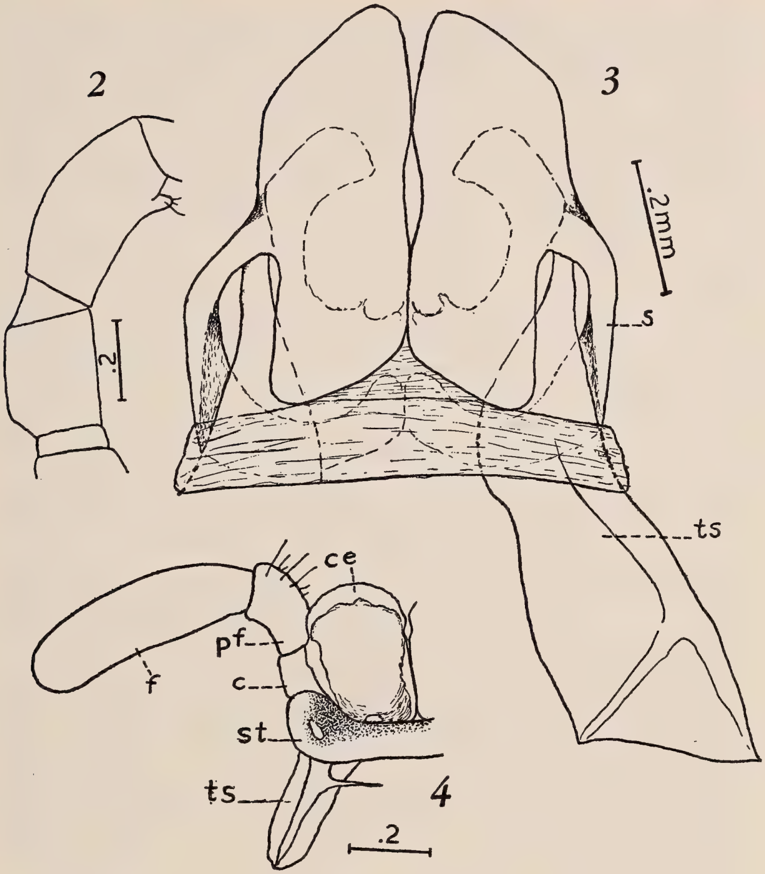
Diagnosis: Nearest *A. specus montivaga,* from which it is easily distinguished by its larger size, the absence of coxal lobes on leg pair 10, and the anterior gonopods, which have the sternites attached at only the middle of the ectal margin instead of all along the basal half of that margin.

Description of the male neotype: Body length about 15 mm, width 1.3 mm. Color and pattern typical of the genus. Ocelli 23; except for the single one on the ectocaudal angle, closely arranged in a triangle which has all sides slightly convex; in curved rows of 1, 7, 6, 5, 3, 1. Antennae slender, approximately 2.3 mm long, ratio of segments 1 through 7 as follows: 9:28:54:34:42:20:13. Gnathochilarium 0.5 mm wide. Segmental setae acute, the longest ones about 0.5 mm long.

Lobation of legs inconspicuous. Distomesial surface of segment 4 of leg pairs 3 and 4 with a small cylindrical lobe, the smallest in the genus. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar.

In ventral view, the anterior gonopods are slightly contiguous along their mesial margin; they curve caudad at the base but straighten out distad; they reach back to the coxae of leg pair 10. From a caudal view, the coxal endites of the posterior gonopods appear as two membranous, quadrate, convex, closely contiguous pieces that cover the complex basal region of the dorsal surface of the anterior gonopods.

A transversely striated band of chitin crosses the ventral surface at the base of the anterior gonopods. The 2 L-shaped sternites together form an irregular, U-shaped support at the sides and across the dorsal surface at the base of the anterior gonopods. The end of the vertical arm of the sternite, carrying the tracheal pouch, is firmly coalesced



FIGS. 2–4. *Austrotyla coloradensis* (Elk Mts., Gunnison Co., Colorado). Fig. 2.—Segments 2 to 4 of third leg of male. Fig. 3.—Anterior gonopods, ventral view. Fig. 4.—Left posterior gonopod, anterior view. Abbreviations: c, coxa; ce, coxal endite; f, femur; pf, prefemur; s, sternite; st, sternum; ts, tracheal pouch.

to the middle of the ectal margin of the gonopod; the opening between the lateral sternal arm, the tracheal pouch, and the ectal margin of the gonopod easily distinguished this species from the others in which the gonopod and the vertical arm of the sternite are coalesced longitudinally. The horizontal arm of the sternite is coalesced to its homologue in the middorsal line. The anterior gonopods (Fig. 3) are smooth on the ventral surface and narrowly rounded at the apex; on the middle of their dorsal surface is a conspicuous, rounded, heavily chitinized lobe and at the base is a transverse shaggy region. I have not seen the spiracles.

The coxosternal joint of the posterior gonopods reaches to the midline of the sternum and is easily seen. From a caudal view, the coxa is about the length of the prefemur; from a cephalic view, the prefemur is longer. The membranous coxite is in the form of a large subquadrate shallow cup that opens cephalad; thin membranes of nearly equal length form the mesial, ventral, and ectal sides of the cup; the mesial margin is irregularly serrated and the ventral margin has one shallow emargination. The prefemur is very slightly clavate distad. The femur is the slenderest in the genus; the ratio of its length to its width is approximately 4/1. The ratio of the length of the prefemur and femur is approximately 2/5.

Figures 2 to 4 were drawn from a male from the Elk Mountains, below Queen Basin, Copper Creek Valley, Gunnison County, Colorado. It differs slightly from the neotype in the shape of the margin of the coxal endite.

Variations: The length varies between 14 and 17 mm. The number of ocelli varies between 23 and 19; the usual number is 22 or 23; when the number is reduced, the loss is in the shorter rows. The shape, position, and size of the lobes of the legs of the male have not been observed to vary significantly. The margins of the coxite of the posterior gonopod show some minute individual variations.

Remarks: The description of *Conotyla coloradensis* Chamberlin, 1910, was based on a female, now lost. Only one other Colorado conotylid has been reported (see the paragraph on *Austrotyla* spp.). My decision to identify this species as the problematical Chamberlin species was made with the full awareness that there are several discrepancies between it and the original description. I made the determination after learning: (1) that this is the most common conotylid in Colorado, and, therefore, the chances are great that it is the one that was described, and (2) that the original description contains errors. The discrepancies between the description of the holotype and my specimens are listed and discussed below:

1) Length of antennae. The only measurement of the holotype is of the antennae, which were stated to be "very long," 4.2 mm. The drawing of an antenna (Chamberlin, op. cit., Pl. 33, Fig. 2) does not suggest unusual length, however; the proportions are essentially what I have found, allowing for slight errors in copying and variations in specimens. In my specimens the antennae are between 2.2 and 2.4 mm long, about five times the width of the gnathochilarium.

The drawings of the gnathochilarium and an antenna of the holotype were stated to have been enlarged 39.5 and 87 times, respectively (Chamberlin, op. cit., p. 260 and Pl. 33, Figs. 1 and 2). If one reduces these drawings accordingly, then the gnathochilarium of the holotype is about 1 mm wide and the antennae about 1.2 mm long. Since such short antennae are not found on any conotylid with a gnathochilarium of that width, an error in the statement of the degree of enlargement is indicated. If it is assumed (1) that the scales of enlargement of these two drawings really refer to enlargement before publication and (2) that the figures were inadvertently interchanged, then the relative sizes of the gnathochilarium and the antennae of the holotype are approximately what I have reported.

The body length of the holotype was not recorded. Loomis (1943), who stated that the length is over 22 mm, reached this figure by deduction (personal letter to Nell B. Causey, 25 Nov. 1960), basing it on Chamberlin's statement that the antennae of the holotype were 4.2 mm long.

2) Gnathochilarium. The gnathochilarium of the holotype was represented (Chamberlin, op. cit., Pl. 33, Fig. 1) as having a minute promentum. The minute triangular space anterior to the mentum does not contain a sclerite.

3) Eyes. One eye of the holotype was drawn (Chamberlin, op. cit., Pl. 32, Fig. 9). The eyes of my specimens differ in that there is an additional ocellus on the ectocaudal angle. It is smaller than the ocelli in the caudal row and easily overlooked.

4) Position of segmental setae. The position of the internal segmental setae of the holotype was described as follows: "Innermost bristle about one-third the distance from median to the edge of the carina of the corresponding side. . . ." (op. cit., p. 237). In my specimens the internal setae of typical body segments are approximately two-thirds the distance from the median to the lateral edge of the body.

Distribution: The Herbert W. Levis made 28 collections of *A. coloradensis,* including 32 mature males and 21 mature females, in 5 Colorado counties between 1952 and 1960. Adults and larvae of both sexes were collected in each of the months of June, July, and August. The collection sites are at altitudes between 3,300 feet and 13,000 feet. Of the 22 collections with habitat data, 3 were made in meadows, 3 in talus, 2 in mixed forests, and 14 in coniferous forests. The specimens that were examined are in the Museum of Comparative Zoology; they are listed below:

BOULDER COUNTY: 4 miles N of Allen's Park, 1 ♂ (neotype). CHAFFEE COUNTY: Monarch Pass, 3 ♂, 2 ♀. EAGLE COUNTY: Gore Mts., 1 ♂. GUNNASON COUNTY: Gothic, 5 ♂, 1 ♀; N slope of Ohio Peak, 2 ♂; Castle Pass, 3 ♂, 2 ♀; Copper Creek Valley, 7 ♂, 5 ♀; 5 miles E of Wuanita Hot Springs, 1 ♂, 1 ♀; Fossil Ridge, 3 ♂, 1 ♀; Cumberland Pass, 1 ♂; Schofield Pass, 1 ♂, 2 ♀; Tincup, 1 ♀; Washington Gulch, 1 ♀. Gunnison-Pitkin County line: Conundrum Pass, 2 ♂, 2 ♀. HINSDALE COUNTY: Slumgullion Pass, 3 ♂, 2 ♀. PITKIN COUNTY: Buckskin Pass, 1 ♀.

With the exception of 2 specimens and the usual run of larvae (from all of the counties listed above and San Miguel County) unidentifiable as to species, all of the chordeumids collected at 30 sites in 7 Colorado counties by the Levis and C. C. Hoff are *C. coloradensis.* One of the exceptions is a female austrotylid from Conejos County. The other is a larva of uncertain generic position from Pitkin County. The Levis' collections from the following Colorado counties contain no chordeumids: El Paso, Montrose, Rio Grande, and Sauguache.

Austrotyla humerosa (Loomis), new combination

Conotyla humerosa Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 384–385, Figs. 5a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Male holotype (U. S. Nat. Mus. No. 1443) collected in Sunnyside Mine, 3 miles southwest of Seneca, Plumas County, California, 22 Jan. 1923, by H. S. Barber.

Range: Known only from the type locality.

Diagnosis: Distinguished by the very high paranota, the reduced number of ocelli, the absence of body pigment, and the attenuated anterior gonopods with 4 or 5 unequal processes on the mesial margin.

The anterior view of the left anterior gonopod that was drawn by Loomis (op. cit., Fig. 5b) clearly shows the vertical lobe of the sternite ectal to the anterior gonopod and establishes the generic position of this species. From a ventral view, the anterior gonopods, broad at the base and narrowed distad, simulate the appearance of the anterior gonopods of trichopetalinids.

A correction of the original description must be made: there is no promentum.

Ecological status: The species is surely a troglobiont that has moved from cave passageways, of which there are many in this limestone area, into the connecting shafts of Sunnyside Mine.

Material examined: Larval male paratype (Museum of Comparative Zoology).

The *humerosa* Group

The *humerosa* group of this genus will be treated in a later paper. They occur in limestone and lava caves of northeastern California and are the only troglobitic conotylinids that have been collected west of the Rocky Mountains. They are much more highly modified by their cave life than the eastern conotylinids, *Austrotyla specus specus, Conotyla bollmani,* and *Conotyla vaga,* all of which have very close epigean relatives and are probably relatively recent cavernicoles.

Austrotyla specus (Loomis), new combination

Austrotyla specus, the most widely distributed species of the genus, is easily distinguished from the other species by the anteriorly directed coxal lobes of the tenth legs of the male. The form of both pairs of gonopods indicates that it is more closely related to *coloradensis* than to *humerosa.* Specimens of both sexes and later larval stages are readily distinguished from *Conotyla pectinata,* with which it is sympatric in the Middle West, by the longer segmental setae and the smaller body.

I recognized two subspecies of *specus.* Their relationship to two other closely related forms in northern New Mexico cannot be determined until more material is available. The nominate subspecies is probably an obligate cavernicole in eastern Missouri and western Illinois; *s. montivaga* is epigean, with a disjunct distribution that presents the greatest problem in this genus; I have identified it from several sites along the upper Mississippi River and Loomis identified it from three sites in the Southwest. The two subspecies have identical gonopods. The lobation of the legs shows a little variation in the size of the lobes, none in position; a conical or slender cylindrical lobe is on the mesial surface of segment 4 of leg pairs 3 and 4.

The differences between *s. specus* and *s. montivaga* are the unspectacular kinds of modifications produced in millipeds by cave life. In *s. specus* there is reduction of body pigment, a slight enlargement of the body, and a slight elongation of the antennae and legs. That *s. specus* is a relatively recent troglobite is indicated by the presence of almost as many ocelli as in *s. montivaga.*

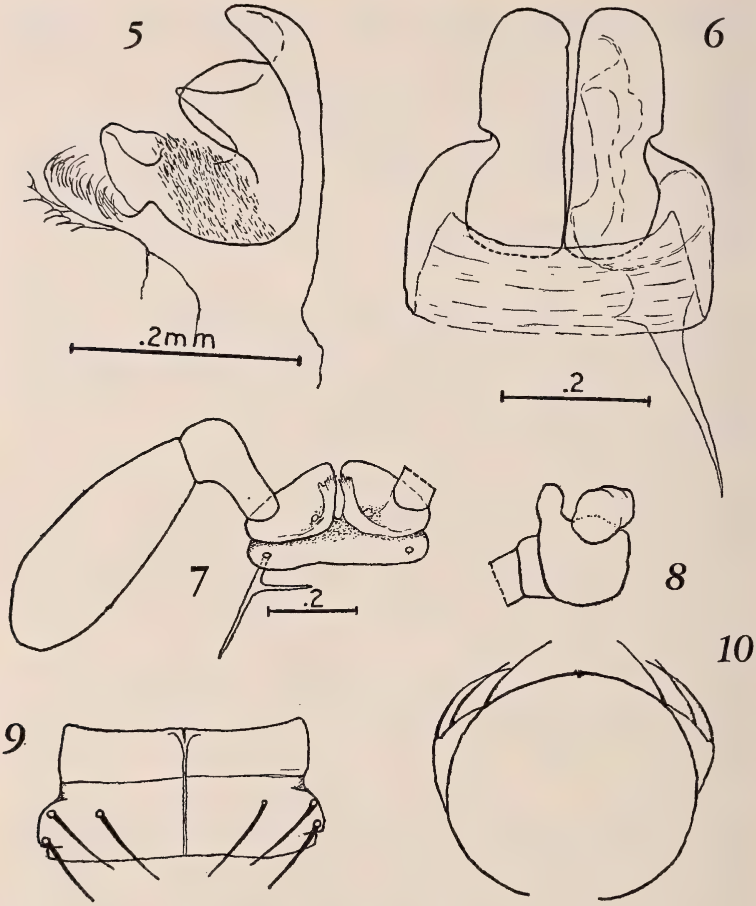
Austrotyla specus specus (Loomis), new combination
Figs. 5–10

Conotyla specus Loomis, 1939, Bull. Mus. Comp. Zool. Harvard, 86(4): 184, Fig. 11a-c; 1943, ibid., 92(7): 382. Hubricht, 1950, Nat. Speleological Soc. Bull., 12: 17. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Nomenclatorial summary: The name *specus* was first applied (Loomis, 1939) to a form collected in two eastern Missouri caves. Later (Loomis, 1943; Hoffman *in* Hubricht, 1950) it was applied to collections from other caves in eastern Missouri and adjacent southwestern Illinois and to an epigean collection (Causey, 1952) from northern Illinois. The epigean form is recognized here as *s. montivaga.* The populations in the caves in the vicinity of the confluence of the Missouri and Mississippi rivers, *s. specus,* are unevenly modified by cave life. Of the specimens that I have seen, those from Meramec Caverns, Jefferson County, Missouri, show the greatest modification, and those from Eckert's Cave, Monroe County, Illinois, show the least; the latter, since they are smaller and more deeply pigmented, might be regarded as intergrades between *s. specus* and *s. montivaga*; the antennae are of the *s. specus* type. It is possible that some of the differences in color and size of the specimens in these cave collections are artifacts produced by the variations in strength and composition of the preservatives.

Male holotype (Museum of Comparative Zoology) collected in Rice's Cave, 3 miles northeast of Goldman, Jefferson County, Missouri, 16 October 1938, by Leslie Hubricht.

Range: Reported from caves in Franklin, Jefferson, and St. Louis counties, Missouri, and St. Clair and Monroe counties, Illinois. These records include possible intergrades with *s. montivaga* in southwestern Illinois.



Figs. 5–10. *Austrotyla specus specus* (Meramec Caverns, Jefferson Co., Missouri). Fig. 5.—Right anterior gonopod, mesial view. Fig. 6.—Anterior gonopods, ventral view. Fig. 7.—Posterior gonopods, anterior view. Fig. 8.—Segments 1 and 2 of third leg of male. Fig. 9.—Outline of segment 10, dorsal view. Fig. 10.—Outline of segment 10, posterior view. Figs. 8–10 are drawn to the same scale.

Diagnosis: Differs from *s. montivaga* in the cave habitat, the reduction of body pigment, the larger body, and the difference in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 4/3.

Description of a male from Meramec Caverns: Body length about 14 mm, width 1.3 mm, legs 1.7 mm long. In alcohol flesh colored; in life probably colorless. Ocelli arranged in a subtriangular area with the ocelli almost touching, the two caudal rows straight except for the single ocellus on the ectocaudal angle, and the other rows uneven; 21 ocelli in rows of 1, 7, 6, 5, 2; the outer halves of the ocelli in the shortest and longest rows are depigmented, giving the eyes a subtriangular appearance. Length of antennae 2.3 mm; the ratio of segments 1 through 7 as follows: 8:24:48:33:29:24:12. Segmental setae acute, conspicuous, and up to 0.5 mm long. Middle of mesial surface of segment 4 of leg pairs 3 and 4 with a slender, conical lobe; the lobes are slightly unequal, with the one on leg pair 4 larger. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar. Coxal segment of leg pair 10 (Fig. 8) with the gland everted; on the distal margin of the coxa is an anteriorly directed lobe, slightly constricted at the base, that is contiguous with the mesial surface of the prefemur of the posterior gonopods.

From a ventral view, the anterior gonopods (Fig. 6) are as broad and rounded at the apex as at the base; there is a small concavity on the middle of the ectal margin at the apex of the sternites which are fused to the ectal margin. Dorsad, the sternites are connected by two narrow arcs that are contiguous in the mid-dorsal line at the base of the gonopods. The apodemes are about the length of the gonopods. The figure of the ventral surface of the anterior gonopods (Fig. 6) shows the right one as it appears after maceration, with the thicker elements on the dorsal surface showing through. The details of the dorsal surface (Fig. 5) are most easily seen from a mesial view. Proceeding from the apex to the base are the following elements: two contiguous flattened lobes, one rounded and the other angular, a rounded lobe covered with short setae, a larger membranous lobe, and a longer narrow lobe that is covered distad with long setae.

From a caudal view of the posterior gonopods, the coxal endites have the appearance of two convex, membranous, triangular pieces that are almost contiguous along their shorter margin. The coxae reach almost to the midline of the sternum, and the sutures between them and the sternum and the prefemurs are easily seen. The coxa, as measured along the ectal surface, is about one-fifth the length of the prefemur. A minute pore is on the mesioventral surface of the coxa adjacent to the mesial lobe of the coxal endite. The coxal endite consists of two lobes; the larger one is membranous, triangular, arises from the mesiocaudal margin of the coxa, the apex reaches to the middle of the length of the prefemur, and its even margins are turned cephalad; the smaller mesial lobe is stiffer and columnar, and distad it is expanded, striated, and contiguous with its homologue. The prefemur is slightly clavate distad. The femur is a little thicker than in *coloradensis*; the ratio of its width to its length is approximately 2/5. The ratio of the length of the prefemur to the length of the femur is also about 2/5.

Variations: Body length 12 to 15 mm. In alcohol colorless to pale brown. Ocelli 20 to 24. Length of antennae 1.8 to 2.3 mm.

Specimens examined: ILLINOIS: MONROE COUNTY: Eckert's Cave, near Burksville, 1 ♂, 24 January 1947. MISSOURI: FRANKLIN COUNTY:

Copper Hollow Sink Cave, 1 ♂, 1 ♀, 8 February 1958. Meramec Caverns, 1 ♂, 2 ♀, 20 December 1957. Fisher Cave, 1 ♀, 8 February 1958. Mushroom Cave, 1 ♂, 8 February 1958.

Austrotyla specus montivaga (Loomis), new status, new combination

Conotyla montivaga Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 383–384, Fig. 4a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Conotyla specus Causey, 1952, Proc. Biol. Soc. Washington, 65: 113.

Male holotype (Museum of Comparative Zoology) collected at 7,500 feet elevation in the Santa Rita Mts., Pima County or Santa Cruz County, Arizona, 29 October 1927, by H. F. Loomis.

Range: Southern New Mexico, southern Arizona (Loomis, 1943), northern Illinois, and southern Wisconsin.

Diagnosis: Distinguished from *s. specus* by the epigean habitat, the smaller, more deeply pigmented body, and differences in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 2/1.

Description (paraphrased from Loomis' description based on an unspecified number of specimens): Body length 9 to 13 mm; pigmentation weak; ocelli 21, in 4 or 5 series arranged in a subtriangular group, 3, 5, 6, 7 or 1, 3, 5, 6, 6; antennae rather short and stout; paranota not becoming apparent until the fourth or fifth segment and completely lacking from the last half dozen segments; males with a long slender lobe on the middle of the ventral surface of segment 4 of leg pairs 3 and 4; ventral surface of tarsal segment of leg pairs 3 to 7 granular; anterior surface of coxal segment of leg pair 10 with a knoblike lobe that projects under the gonopods; "both anterior and posterior gonopods show the close relationship to *specus* although they exhibit obvious differences."

I have made the following observations from the male holotype: body length about 9 mm, body thickness 1 mm; no promentum; length of antennae approximately 1.8 mm, the ratio of segments 1 through 7 as follows: 9:22:47:20:32:18:9; the ocelli were not recounted; small cylindrical lobes, approximately twice as long as they are thick, are on the middle of the mesial surface of leg pairs 3 and 4; the ventral surface of leg pairs 3 through 11 is pulvillar; the length of the longest segmental setae, most of which have been rubbed off, is 0.35 mm; the details of both pairs of gonopods, including the complex dorsal surface of the anterior pair, are as in *s. specus* (Figs. 5–7).

Variation: The length of the specimens that I have seen is between 9 and 10 mm. There are 23 or 24 ocelli in rows of 1, 7, 6, 5, 4(3), 1. The antennae are from 1.3 to 1.8 mm long. The lobes on segment 4 of leg pairs 3 and 4 are thick and conical in the Illinois specimens and slender and cylindrical in the Wisconsin specimens; no marked differences were observed between the size of the lobes on leg pairs 3 and 4 in any one male. The segmental setae are from 0.3 to 0.5 mm long. The shape of the margins of the lobes on the dorsal surface of the anterior gonopods varies minutely from *s. specus*; the variation is possibly of an individual or a clinal nature.

Specimens examined: ARIZONA: Santa Rita Mts., male holotype. ILLINOIS: CARROLL COUNTY: Smith Park, Mt. Carroll, 2 ♂, 1 ♀, 6 December 1945; Pallisades State Park, 1 ♂, 6 December 1945. WISCONSIN: SAUK COUNTY: Devil's Lake State Park, in pine litter on east bluff, 2 ♂, 13 October 1955. VERNON COUNTY: (tentative determinations) 1 mile east of Coon Valley, in oak litter, larvae, 2 September 1954; 5 miles north of Viola, in mixed hardwood litter, larvae, 2 September 1954.

Austrotyla spp.

Specimens undetermined as to species, all collected by C. C. Hoff, have been examined from the following sites: COLORADO: CONEJOS COUNTY: Cumbres Pass, 10,000 feet alt., 1 ♀, 3 September 1952. NEW MEXICO: SANDOVAL COUNTY: 12 miles E of Cuba, 8,800 feet alt., in deep, moist Gambel oak litter in yellow pine zone, 1 ♀, larvae, 26 August 1953. SANTA FE COUNTY: Baldy Mt., 11,400 feet alt., larvae, 11 August 1953. TAOS COUNTY: Mt. Wheeler trail, S of Red River Village, 10,300 feet alt., larvae, 8 September 1953.

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SIPHOGENERITA, NEW GENUS, AND A REVISION OF CALIFORNIA CRETACEOUS "*SIPHOGENERINOIDES*" (FORAMINIFERIDA)

By Max A. Furrer
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Topotype material of all California species and subspecies of *Siphogenerinoides* was recently obtained by our laboratory. A. R. Loeblich, Jr., called the attention of the writer to certain discrepancies between the type species, *Siphogenerinoides plummeri* Cushman and the California species. A subsequent study of topotypes of *S. plummeri* and a survey of the literature concerning *Siphogenerinoides* demonstrated the presence of these inconsistencies. In view of the importance of this genus to California biostratigraphy it was decided to restudy the internal morphology of the test, particularly the arrangement of the early chambers and the siphon in order to clarify the somewhat doubtful systematic position of the California species of *Siphogenerinoides*.

The writer gratefully acknowledges the help received from several persons. A. R. Loeblich, Jr., California Research Corporation, La Habra, California, provided some of the material and also suggested the present study. William Lewis, Standard Oil Company of California, Oildale, California, supplied type material from two localities in California. Helen Tappan Loeblich, University of California at Los Angeles, drew the text figure and two figures on the plate and critically read the manuscript. Other illustrations were prepared by Lawrence Isham, scientific illustrator, Washington, D. C.

The genus *Siphogenerinoides* was introduced by Cushman in 1927. As type species he selected *Siphogenerina plummeri* which he had first briefly mentioned in a paper on the genera *Siphogenerina* and *Pavonina* (1926a: 18). Comparing it to the Recent *Siphogenerina australiensis*

Cushman wrote: "There is a very slender species with numerous uniserial chambers and 10 to 12 costae, which occurs in the Navarro, Upper Cretaceous clays, one-half mile south of Kemp, Texas. This may be known as *Siphogenerina plummeri* Cushman, new species, and will be figured later."

Siphogenerina plummeri was described and figured later in the same year (Cushman, 1926b: 15) and a specimen was designated as holotype from the Upper Navarro, exposed along Walker Creek in Milam County, Texas. No mention was made as to the presence or absence of an internal tube. Without reference to any generation, the early stage was described as being biserial.

One year later Cushman published his outline of a reclassification of the foraminifera wherein he proposed the genus *Siphogenerinoides* with *Siphogenerina plummeri* as type species (Cushman, 1927: 63). At this time he positively stated the absence of siphons between the chambers and again mentioned the biserial initial stage.

The first adequate description of *Siphogenerinoides plummeri* was given by Plummer (1931: 183). Excepting some modifications concerning the internal tube, nothing can be added to her observations. Of great interest are Plummer's conclusions as to the generic affiliations: "The genotype of *Siphogenerinoides* is here placed in the family Buliminidae Cushman, of which the internal tube is a fundamental character. Whereas *Siphogenerina,* characterized by its triserial initial stage, has probably evolved from *Bulimina* through *Uvigerinella* with its collared aperture and *Uvigerina* with its aperture bounded by a neck and phialine lip, *Siphogenerinoides* has probably arisen through bolivine stock. The frequent twisting of the earliest biserial chambers of the microspheric test is possibly an inheritance from *Virgulina* and *Bolivina.* The basic characters that differentiate *Siphogenerinoides* from *Siphogenerina* are, therefore, the biserial arrangement of numerous early chambers of the microspheric form."

Galloway's manual (1933: 379) listed *Siphogenerinoides* as a synonym of *Siphogenerina.*

In his monographic treatment of *Siphogenerinoides,* Stone (1946) reached the conclusion that the two genera are to be separated because of the differences in their apertural features. He considerably emended Cushman's original definition of *Siphogenerinoides* and included the statement that the early chambers of the microspheric form of S. *plummeri* were triserial exhibiting an irregular configuration.

The last edition of Cushman's *Foraminifera, Their Classification and Economic Use* (1948: 260), again mentions biserial initial chambers for *Siphogenerinoides.*

In a careful analysis of the internal structure of *Siphogenerinoides plummeri* Montanaro Gallitelli (1957: 148) confirmed the biserial arrangement of the early stage. She maintains that, "a relationship of *Siphogenerinoides* with triserial genera must be excluded."

Recently, I was able to examine a large number of topotypes of

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Siphogenerinoides plummeri. In order to obtain a better view of the initial chambers and the internal tube Troelsen's acid treatment (1954) was successfully utilized. With the chamber walls eroded in this manner all specimens examined showed an unquestionably biserial *Bolivina*-like arrangement just as described by Plummer and Montanaro Gallitelli.

To date, two species and one variety of *Siphogenerinoides* have been reported from California, namely *Siphogenerinoides clarki* Cushman and Campbell, 1936 (see attached plate, Figs. 5, 6, 10a,b,c), *Siphogenerinoides clarki* Cushman and Campbell var. *costifera* Cushman and Goudkoff, 1944 (= Figs. 8a,b,c,g, herein) and *Siphogenerinoides whitei* Church, 1941 (see Figs. 4a,b,c, 6, herein). Examining the original descriptions one notes that in all three cases the early chambers of the microspheric generation are clearly stated to be triserial. For the present study large samples of topotype material were available and therefore hundreds of microspheric tests were treated with hydrochloric acid. Without exception, the neanic stages of the three species were found to be triserial. The internal siphon, however, appears to be formed in the same way as in *Siphogenerinoides plummeri* (Figs. 1a,b, 2, 3a,b, herein). As observed by Montanaro Gallitelli (1957) the internal "tube" is not a complete cylinder, but a spoutlike hemicylinder connecting the foramen on the upper and lower side of a chamber. But this spout does not extend through the openings as it seems to pierce the septal wall in a separate small circular hole in such a manner that the concave side of the spout faces the foramen (see text, Fig A). There is not a single continuous, twisted spout present throughout the whole length of the test because the spouts grow visibly out of each septal wall or rather out of the lip or weltlike structure surrounding the aperture. The position of attachment of the spout connecting two chambers is diametrically opposite because the position of successive openings is axially oriented at the rate of 120°–180°.

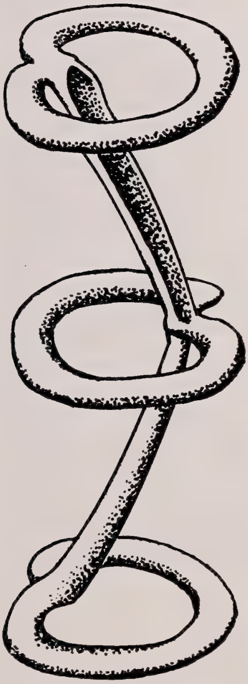
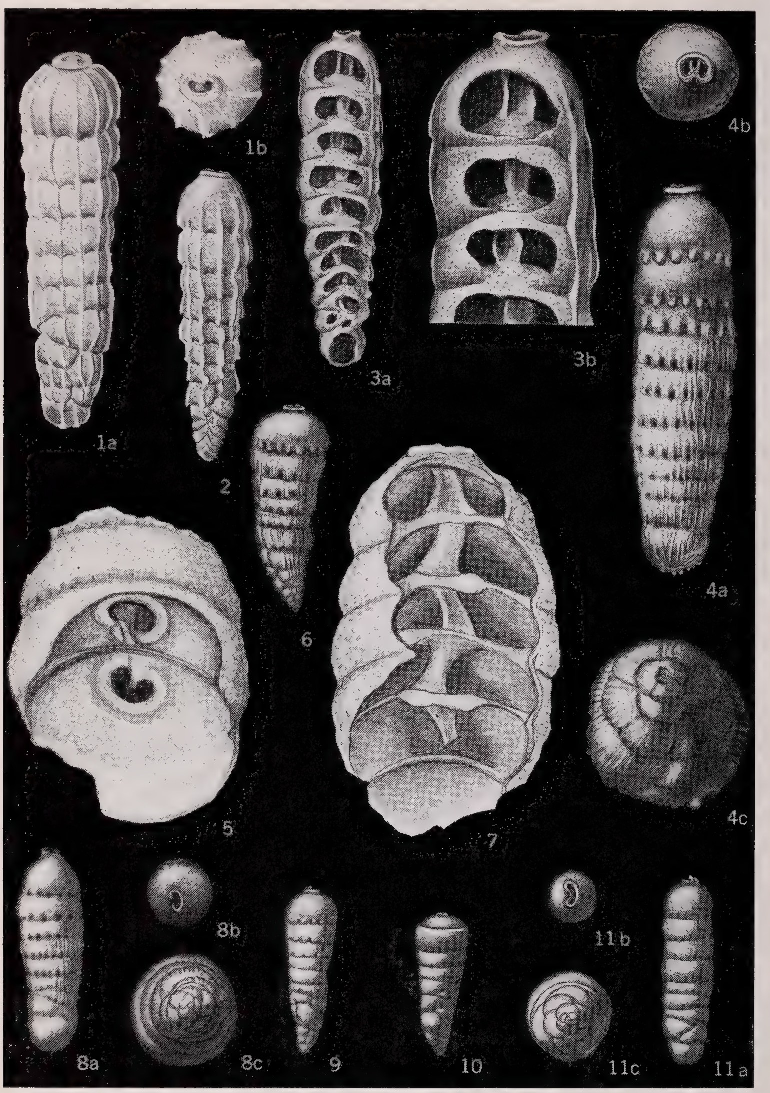


FIG. A. Portion of the columellar process and apertural rim in *Siphogenerita whitei.*

From this closer examination of the internal structure of the Californian species of "*Siphogenerinoides*" thus emerge two relationships:

1. With the genus *Siphogenerinoides,* because of the columellar process and apertural features, and also the general test morphology.
2. With *Siphogenerina,* because of similarity of test and the triserial neanic stage in the microspheric generation.



FIGS. 1–3. *Siphogenerinoides plummeri* (Cushman) topotypes (USNM P5453) from the Upper Cretaceous, Navarro group, in the bank of Walker Creek, 6 miles N 15° E of Cameron, 1 mile upstream from the intersection of Walker Creek and the Cameron-Clarkson road, Milam County, Texas. Collected by H. J. Plummer. Figs. 1a, 2—sideviews; 1b—top view (all ×73). Fig. 3a—sectioned topotype (USNM P5455), showing internal tube (×73). Fig. 3b—enlarged upper part of the same specimen (×143).

Since no biserial microspheric specimens have been found among the Californian species and on the other hand no triserial microspheric generation of *Siphogenerinoides plummeri* is known, dimorphism is to be ruled out. It appears then that in spite of their similarities to *Siphogenerina* and *Siphogenerinoides* the California species cannot be placed in either genus but must be allocated to a new genus for which the name *Siphogenerita* is proposed. Because of its triserial early chamber arrangement the new genus is here included in the family Uvigerinidae.

Order FORAMINIFERIDA Zborzewski, 1834
Superfamily BULIMINACEA Jones, 1875
Family Uvigerinidae Cushman, 1913
Genus **Siphogenerita** Furrer, new genus

Type species: Siphogenerinoides clarki Cushman and Campbell, 1936.

Test free, elongate, length up to 2.3 mm. Circular to subcircular in transverse section, megalospheric forms well rounded at both ends, microspheric forms rather distinctly tapering. Early stage in microspheric generation triserial, passing into a relatively short biserial stage, then uniserial. Megalospheric forms with large proloculum followed by biserial and uniserial stages. Chambers somewhat inflated, sutures distinct, depressed. Wall calcareous perforate, finely porous, frequently ornamented with longitudinal costae or striations. Columellar process consisting of spoutlike hemicylinders changing the position of their convex side at a rate of 120°–180° in each successive chamber. Spouts do not pass

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FIGS. 4–7. *Siphogenerita whitei* (Church) from top of cored interval 325–335 feet, Marca No. 3, near the center of Sec. 6, T. 15 S, R. 12 E, Mount Diablo Baseline and Meridian, Panoche Quadrangle, Fresno County, California. Fig. 4a—sideview of megalospheric test; 4b—apertural view; Fig. 6—side view of microspheric test; all ×20.5. Fig. 4c—view of early chamber arrangement in microspheric test, ×41. Figs. 5, 7—dissected tests showing alternating position of the semicylindrical spouts and the foramen in successive chambers (×48).

FIGS. 8–9. *Siphogenerita clarki* (Cushman and Campbell) var. *costifera* (Cushman and Goudkoff) from a core at interval 6971–80 feet in Jergins Oil Cheney Ranch No. 1 Well, in Sec. 29, T. 14 S, R. 13 E, Fresno County, California. Fig. 8a—sideview of megalospheric test; Fig. 8b—apertural view; Fig. 9—sideview of microspheric test; all ×20.5. Fig. 8c—view of microspheric early chamber arrangement (×41).

FIGS. 10–11. *Siphogenerita clarki* (Cushman and Campbell) from Marsh Creek at the bend just below mouth of Briones Creek, S ½, SW ¼, NW ¼, Sec. 35, T. 1 N, R. 2 E, Mount Diablo Baseline and Meridian, Byron Quadrangle, Contra Costa County, California. Fig. 10—sideview of microspheric test; Fig. 11a—sideview of megalospheric test; Fig. 11b—apertural view; all ×20.5. Fig. 11c—view of microspheric early chamber arrangement, ×41.

through foramen but grow out of the welt- or liplike structure surrounding the aperture, thus not forming an uninterrupted, continuous siphon. The concave side of the spout always faces the apertural opening. Aperture terminal, elliptical, or reniform with short neck and distinct lip. Terminal feature of columellar process is a small circular opening outside aperture and adjacent to its concave side.

Occurrence: Upper Cretaceous, Coniacian–Maestrichtian.

Remarks: Siphogenerita, new genus, differs from *Siphogenerinoides* in having a triserial initial chamber arrangement. The spoutlike hemicylinders forming a discontinuous siphon which does not pass through the foramen distinguish the new genus from *Siphogenerina.*

From a study of the literature and without having examined actual material it seems evident that most western hemisphere species of *Siphogenerinoides* must be placed with *Siphogenerita.* This applies in particular to the species from Peru erected by Stone (1946), Cushman's Venezuelan species (1929) and the forms described by Petters (1954) and Redmond (1955) from Colombia. *Siphogenerinoides cretacea* Cushman subsp. *idkyensis* Colom, 1948, first reported from the Upper Cretaceous of the Spanish Sahara undoubtedly belongs to *Siphogenerita.* In a recent paper (Chenouard, de Klasz and Meijer, 1960: 71) two new species, *Siphogenerinoides clavata* and *Siphogenerinoides dentata* were described from the Upper Cretaceous of West Africa. Diagnosis and illustrations clearly demonstrate them to be *Siphogenerita.*

Siphogenerinoides oveyi Nakkady and *S. oveyi* var. *compressa* Nakkady (1950) both found in the Upper Cretaceous of Egypt are apparently true *Siphogenerinoides.* This survey of the literature indicates that a number of synonyms occur among species of *Siphogenerinoides* and *Siphogenerita* respectively, but without an examination of the material no changes will be suggested at present.

We are facing here a somewhat similar situation to that which existed prior to 1945 for *Siphogenerina* which then included forms with biserial as well as triserial neanic chambers in microspheric tests. Mathews (1945: 588) separated these, leaving those with biserial neanic chambers as *Siphogenerina* and erecting for those with triserial early stage the new genus *Rectuvigerina* (which was divided into two subgenera *Rectuvigerina s. s.* and *Transversigerina,* on the basis of shape of the sutures). There is, however, a certain difference between the splitting of *Siphogenerina* and *Siphogenerinoides* because dimorphism undoubtedly occurs in the former. Bandy (1952: 17) reported both tri- and biserial tests among specimens of *Siphogenerina costata* from its type area in the south Pacific Ocean (Tahiti).

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ALLOMETRY AND SPECIATION IN *ECACANTHOTHRIPS* BAGNALL

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Hood (1935) suspected that synonymous names existed within the genus *Ecacanthothrips,* in view of the extreme variability of the forecoxae he found in the males of *E. priesneri* Hood. To quote Hood, "similar variability is to be expected among its congeners and as this character has been used as a prime one in the definition of species, there can be little doubt that synonymous names exist in the genus. Several species such as *inermis, bagnalli, crassiceps, inarmatus* and *coniger* appear to be thoroughly distinct, but the remainder of the genus centering about *sanguineus,* requires careful study of a large series of specimens." A study of different populations of *Ecacanthothrips* has confirmed several facts concerning the speciation of this genus. Several species are on record, mostly described from uniques or a few isolated specimens such as *E. bryanti* Bagnall, *E. coxalis* Bagnall, *E. steinskyi* Schmutz, *E. fletcheri* Ramakrishna, *E. ramakrishnai* Ananthakrishnan, *E. erythrinus* Ananthakrishnan, *E. flavipes* and *E. priesneri* Hood—all in the opinion of the author, only synonyms of *E. sanguineus* Bagnall. These species were erected because of insufficient knowledge of the enormous variations exhibited by *E. sanguineus,* so extensive as to be almost unbelievable. The individuals in a population fall into a finely graded series, so that the two opposite ends of the series, the gynaecoid and the oedymerous forms are strikingly different. This being the case, such characters adopted in the speciation by the protologists of the species, such as the color of the body, head length/width index, head length/tube length index, the structure of the forefemora and tibia, the coxal prolongation in the males, the number and position of the foretibia tubercles and *even the number of cones in the third antennal joint and the accessory setae of the forewings,* have been found to be very inconsistent in view of the enormous range of variation exhibited by the individuals *in a population from the same host.* The accompanying range of measurements and the figures provide ample data for confirming the invalidity of the species mentioned above and careful scrutiny will reveal that all these species fall within the range of variation exhibited by them.

It is my pleasant duty to thank the authorities of the British Museum of Natural History, London, for extending me all the facilities for studying their collection of Thysanoptera and also to Dr. H. Priesner of Linz (Austria) for having given me the privilege of examining his collection during my stay in Linz. My thanks are also due to K. S. Ananthasubramanian of this department for having helped me in the collection of several of the forms discussed below.

The present observations are based on the following material:

(1) 19 males and 12 females and numerous larvae from neem bark, Palghat, Kerala, S. India.

(2) 16 males and 12 females and numerous larvae in the decaying bark of *Moringa moringa,* Madras, along with several individuals of staphylinid beetles and the caterpillars of the moringa pest (*Eupterotes mollifera*). An interesting feature is that the females of *Ecacanthothrips* laid their eggs within the moulted skin of the caterpillar and eclosion and the coming out of the first instar larva were observed in the laboratory.

(3) 20 males and 15 females from within dried twigs of *Sesbania.* This seems to be an abode of this thrips; several clusters of 10–42 eggs were found within the crevices.

(4) 12 males and 10 females from the sheaths of the coconut palm, Madras.

(5) 8 males and 10 females from the sheaths of a palm, Madras.

That allometry exists in *Ecacanthothrips* was established by Hood even from the four males he had of *E. priesneri,* but he was unaware of the existence of the very many intergrading forms. As such, he described *E. priesneri* as a new species and also provided a tentative key for such species as *flavipes, bryanti, steinskyi, sanguineus, coxalis,* and *priesneri,* based on the color schemes of the forelegs and antennal joints 3–5, along with the proportionate lengths of joints 3–5. The present study has established beyond doubt that these are no longer tenable, being mere variations found within a population and while the majority of the individuals possess antennal joints 3, 4, and 5 brownish, some individuals have the basal half of 3, 4, and 5 yellow, the rest brown. Again, the proportionate lengths of the antennal joints 3–5 in *steinskyi* and *priesneri* have been mentioned as being 123, 132, 126 μ and 140, 147, 144 μ respectively, but measurements of all the males within a population have proved the range in each case to be, 98–168, 126–172, and 112–168 μ.

From the point of view of body coloration, every grade from dark,

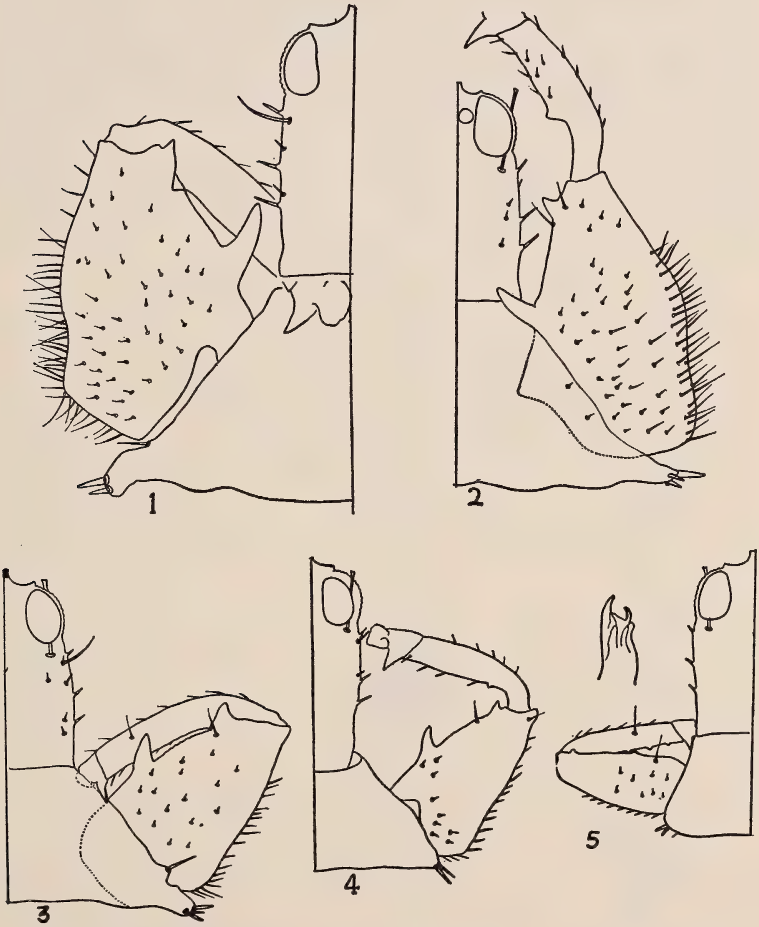

Fig. 1. *Ecacanthothrips sanguineus* Bagnall. 1.—Head, prothorax, and forelegs (on one side) of a maximum oedymerous male. 2–5.—The same, depicting the gradation in the reduction in the size of the forelegs. 5.—Gynaecoid male, with the side view of the apex of the pseudovirga. (All the setae on the forelegs are not shown.)

blackish brown without any trace of red pigmentation, through light brown with red pigmentation to almost entirely reddish individuals are met with. The number of cheek setae on raised prominences are constant for all the members in a population, three pairs being normally present. However, in all oedymerous forms and in those which show the tendency to be so, two or three pairs of smaller, accessory setae are present in between the three primary ones.

A significant feature is that the gynaecoid males, in general, appear so feebly developed as to lose all the typical male *Ecacanthothrips* characters, except for the genitalia. Practically all other morphological characters of the average male, not to speak of the oedymerous forms, are strongly suggestive of female traits: for example, a strong pronotum, strong forefemur and teeth, and particularly the absence of a coxal

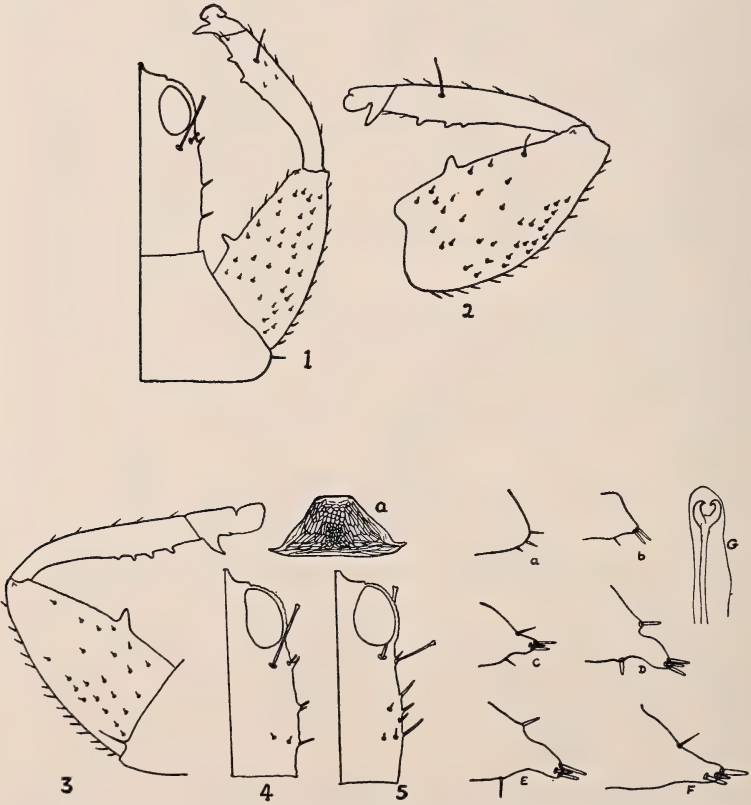

FIG. 2. *Ecacanthothrips sanguineus* Bagnall. 1.—Head and prothorax of female (one half). 2, 3.—Forelegs of female. 4.—Head of female (one half). 5.—Head of male (one half). a.—Pelta. a.–f.—Coxal prolongation. g.—Apex of pseudovirga.

prolongation. This is again confirmed by the fact that the gynaecoid males develop tibial tubercles beyond the middle region of the foretibia, a feature totally lacking in the normal and oedymerous males, but present only in the females. In the typical males, the proximal region of the foretibia is clearly concave and possesses one prominent tubercle while all the distal tubercles are not developed, or at most the inner margin of the foretibia is rugged. In the maximum oedymerous males, the outer margin of the forefemora at base tends to be clearly concave and is provided with a cluster of fine hairs. This concavity becomes progressively reduced along with the size and number of the fringing hairs as we proceed along the series, down to the gynaecoid individuals. Thus, in the gynaecoid males, the outer margin of the forefemora is normal, possessing a few weak setae and the proximal forefemoral tooth is very much reduced and the apical tooth hardly visible—features again suggestive of female traits. As such, speciation based on the forefemora possessing basally an excavated outer margin, provided with long, fringing hairs, becomes no longer tenable.

TABLE 1.—*Range of measurements in μ unless otherwise specified.*

	Males	Females
Total body length	2.240–4.228 mm	2.940–4.060 mm
Head, length	350–518	350–462
Head, width across eyes	210–280	224–280
width across cheeks	226–266	252–308
Postocular, length	112–172	112–154
Cheek spines, length: 1	14–28	14+
2	14–42	14–28
3	14–56	14–28
Antennal joints, length: 3	98–168	126–154
4	126–172	140–168
5	112–168	140–168
Antennal joints, width: 3	56–91	70–84
4	42–70	56
5	35–42	42–70
Prothoracic width at posterior margin (inclusive of coxae)	392–1022	420–700
Width of forefemora	126–378	126–280
Basal forefemoral tooth, length	28–140	14–56
Apical tooth, length	7–98	—
Number of accessory setae of forewings	12–25	15–19
Tube, length	168–280	172–266

(A very detailed account of the measurements of every individual in a population will be published elsewhere.)

Some males were also observed in the same population, with a body size range in between the gynaecoid and the oedymerous forms, but yet with poorly developed forefemora and coxae.

The range of variation shown by the number of accessory setae of the forewings and the number of sense cones on the third antennal joint ranging from 12–25 in either case, further confirm the invalidity of all the species.

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